HEWLETT PACKARD

Operation Manual

HP 70205A and HP 70206A GRAPHICS DISPLAY

SERIAL NUMBERS

This manual applies directly to HP 70205A and HP 70206A graphics display with serial numbers prefixed 2731A and below.

Certification

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

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This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

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HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error-free.

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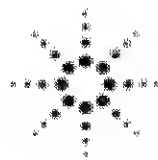
Agilent Technologies

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Safety Symbols

The following safety symbols are used throughout this manual. Familiarize yourself with each of the symbols and its meaning before operating this instrument.

Caution	The CAUTION sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.
Warning	The WARNING sign denotes a hezard. It calls attention to e procedure which, if not correctly performed or edhered to, could result in injury or loss of life. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

General Safety Considerations

Warning	BEFORE THIS INSTRUMENT IS SWITCHED ON, make eure it has been properly grounded through the protective conductor of the ac power cable to a eocket outlet provided with protective eerth contact. Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminel can result in personal injury.
Warning	There are voltages at many points in the instrument which can, if contacted, cause personal injury. Be extremely careful. Any edjustments or service procedures thet require operation of the instrument with protective covers removed should be performed only by trained service personnel.
Caution	BEFORE THIS INSTRUMENT IS SWITCHED ON, make sure its primary power circuitry has been adapted to the voltage of the ac power source. Failure to set the ac power input to the correct voltage could cause damage to the instrument when the ac power cable is plugged in.

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HP 70000 Modular Measurement System Documentation Outline

Instruments and modules of the HP 70000 Modular Measurement System are documented to varying levels of detail. Modules that serve as masters of an instrument require operation information in addition to installation and verification instructions. Modules that function as slaves in a system require only a subset of installation and verification information.

Manuals Supplied with Module

Installation and Verification Manual

Topics covered by this manual include installation, specifications, verification of module operation, and some troubleshooting techniques. Manuals for modules that serve as instrument masters will supply information in all these areas; manuals for slave modules will contain only information needed for slave module installation and verification. Master module documentation may also include some system-level information.

Operation Manual

Operation Manuals usually pertain to multiple- and single-module instrument systems. Topics include preparation for module use, module functions, and softkey definitions.

Programming Manual

Programming Manuals also pertain to multiple- and single-module instrument systems. Programming Manual topics include programming fundamentals and definitions for remote programming commands.

Service Manual, Available Separately

This manual provides service information for a module, including module verification tests, adjustments, troubleshooting, replaceable parts lists, and replacement procedures. For ordering information, contact a Hewlett-Packard Sales and Service Office. This manual is not always immediately available for new products. (NOTE: Some earlier service manuals are titled *Technical Reference*.)

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Figures

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Display Overview

Introduction

This chapter covers the operation and capabilities of the HP 70205A Graphics Display and the HP 70206A System Graphics Display.

An HP 70000 Series measuring instrument consists of a mainframe and a set of modules (for example, a spectrum analyzer composed of a local oscillator, an IF section, and an RF section). However, such an instrument has neither a keyboard nor a display (CRT): the measuring instrument itself is separate from the display. An HP 70000 Series display is an essential part of a manually operated system and a powerful addition to a remotely operated system.

A display provides such capabilities as:

- A screen for one or several instruments to write on.

- A keyboard to control one instrument at a time.

- System-wide error reporting.

- Hardcopy output capability without the need for an external controller.

For a more complete description of the display features, see Chapter 2, "Softkey Reference."

Front-Panel Concept

The graphics displays serve as the "front panel" for instruments in the HP 70000 Modular Measurement System. It is possible to use one display with multiple measurement systems, one display for a single system, or even multiple displays for the same system.

The compact HP 70205A Graphics Display and the larger HP 70206A System Graphics Display each have one display with 14 unlabeled menu keys next to it. See Figure 1-3. These keys are labeled on the screen by whichever instrument owns the keyboard. Menu keys are used for all manual instrument-control functions.

Notation Conventions   Throughout this manual, menu-key labels are denoted as TEXT.
Fixed-label keys are denoted as (TEXT). Fixed-label keys on the
HP 70205A differ slightly from fixed-label keys on the larger
HP 70206A. For example, on the HP 70206A the display key
is denoted by (DISPLAY), while on the HP 70205A the same key
is abbreviated (DSP). The key functions are identical, but the
HP 70206A key labels (unless noted otherwise) are used throughout
this operating manual.

Fixed-label Keys: For data entry, each display has a single knob and 15 labeled keys
(0 through 9, decimal point, minus sign, back-space, step-up, and
step-down). In most cases, data can be entered with either the
numeric keypad (0—9), the display knob, or the step keys. In
addition there are seven other keys (five on the HP 70205A):

(I/P)   (Instrument Preset) When an instrument (such as
the spectrum analyzer) owns the keyboard, pressing
(I/P) will cause that instrument to preset many of
its own operating parameters. This returns the
instrument menu to the screen if the Display menu is
in use, but does *not* affect operation of the display.

(USER)   ((USR) on the HP 70205A) This key brings np
the 14 menu keys most commonly needed by the
user for instrument control. These keys are also
available under the (MENU) key, although more than
one keystroke is required to reach them. For more
information on the (USER) key, including instructions
for modifying the (USER) keys, refer to the operation
manual for the master module in your system.

(MENU)   ((MNU) on the HP 70205A) This key brings up a
more general menu of menu keys for instrument
control. This provides access to all menu keys for
the instrument you are currently using. For most
operations, this key accesses more functions than
the (USER) key, but is less convenient. For more
information, refer to the operation manual for the
master module in your system.

(DISPLAY)   ((DSP) on the HP 70205A) This key calls up a set
of menu keys used to control the operations of the
display itself. For more information about the
individual menu keys under (DISPLAY) key, refer to
Chapter 2, "Softkey Reference."

(LOCAL)   ((LCL) on the HP 70205A) This key returns all
modules in the system to local control from HP-IB
remote.

(PRINT)   (HP 70206A Only) This key starts a raster print
output of the present display screen over HP-IB (the
same as the PRINT menu key).

[PLOT]   (HP 70206A Only) This key starts a vector plot output of the present display screen over HP-IB (the same as the PLOT menu key).

A section in this chapter entitled "Display Capabilities" gives some examples of how to use the different menu key levels found under the [DISPLAY] key.

HP 70205A Graphics Display

The graphics display is a 3/8-width module with 5-inch raster display screen which provides the human interface and manual control capability of the HP 70000 Modular Measurement System. It displays instrument status and measurement output, and it has graphics, trace, text, and marker capability. Controls include 14 user-definable menu keys, 10 data keys (numbered 0 through 9), 10 control keys, and a control knob. Instrument control is accomplished using menu keys to establish an interactive front-panel for your instrument.
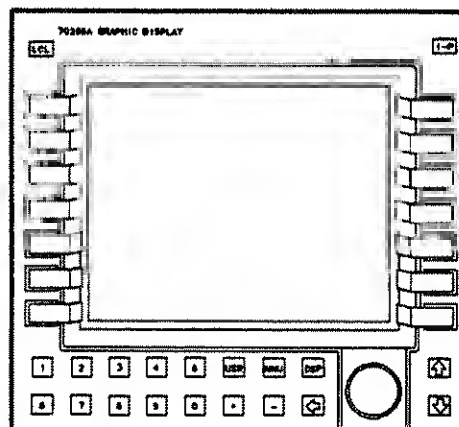
Figure 1-1. HP 70205A Graphics Display
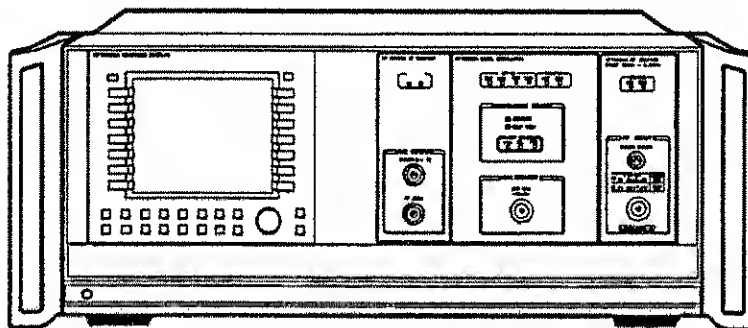
Figure 1-2.
HP 71100A Spectrum Analyzer Including HP 70205A Graphics Display

There are 14 menu keys, 7 on each side of the CRT display. Three keys ((USR), (MNU), and(DSP)), are located underneath the CRT, each providing access to a different set of menu keys. Pressing any one of these keys brings up a menu of menu keys on the screen. Some of

these menu keys provide further access to other menus. If the display is used as a stand-alone display, the (USER) and (MENU) keys will *not* hring up a menu or menu keys.
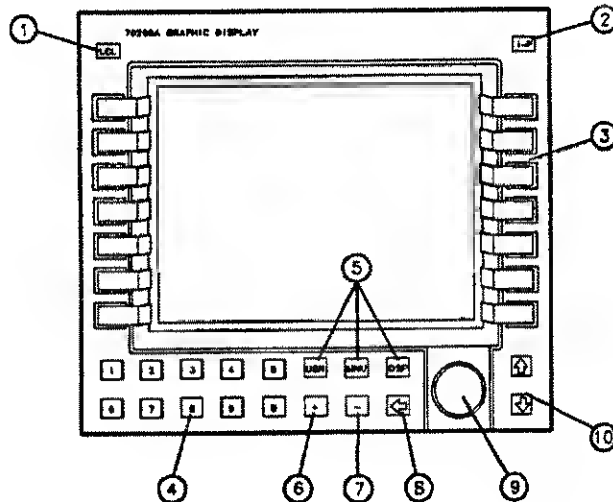
Figure 1-3. HP 70205A Graphics Display

1. (LCL) This key returns the instrument from HP-IB remote to local control.

2. (I/P) This key activates all the preset conditions of the instrument presently controlled hy the keyboard.

3. **Menu Keys** These keys are used for most instrument and system control operations.

4. **Nnmeric Keypad (0 through 9)** This keypad enters numeric values.

5. (USR), (MNU), (DSP) keys, These keys are used to access three different top-level menu key menus.

6. (.) This key enters a decimal point.

7. (−) This key is used for entering negative numbers.

8. (←) This key is used to move from a lower level of menu keys to the next higher level. It is also used in data entry to move the cursor.

9. **Display Knob** This knob is used to change parameter values and to select alpha characters.

10. (⇑) (⇓) These two keys are used to change parameters up or down.

HP 70206A System Graphics Display

The system graphics display is a stand-alone, large, easy-to-read screen display for the HP 70000 Modular Measurement System. It has a 9-inch raster CRT, System II frame and is stack-compatible with the HP 70001A Mainframe and other System II instruments. It supplies the same display and manual control capability as the HP 70205A Graphics Display.

The primary advantages of the HP 70206A are its large display size and the fact that when it is used in place of the HP 70205A, three-eighths of the mainframe capacity is released for use by other modules.
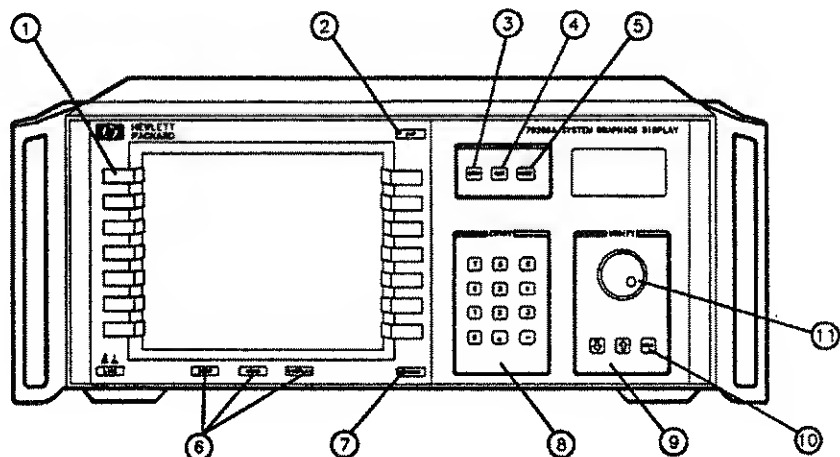
Figure 1-4. HP 70206A System Graphics Display

1. **Menu Keys** These keys are used for most instrument and system control operations.

2. (I/P) This key activates all the preset conditions of the instrument presently controlled by the keyboard.

3. (LOCAL) This key returns the instrument from HP-IB remote control to local control.

4. (PLOT) This key starts a vector plot output of the present display screen over HP-IB (the same as the PLOT menu key).

5. (PRINT) This key starts a raster print output of the present display screen over HP-IB (the same as the PRINT menu key).

6. (USER) (MENU) (DISPLAY) These keys call the top level menu key menus to the screen.

7. (←) This key is used to move from a lower level of menu keys to the next higher level. It is also used in text entry to move the cursor.

8. **Numeric Keypad** This keypad enters numeric values.

9. ⬆ ⬇ These two keys are used to change parameters up or down.

10. (HOLD) This key deactivates the function displayed in the active function area; the readout is blanked from the screen.

11. **Display Knob** This knob is used to change parameter values, and to select alpha characters.

Display Capabilities

The following section is a brief overview of what the HP 70205A and HP 70206A graphics displays can do. The display's capabilities are discussed in detail in Chapter 2, "Softkey Reference."

The display serves as the central user interface for all instruments on the HP 70000 Series instrument bus, HP-MSIB (Hewlett-Packard Modular System Interface Bus). It provides a screen on which the instruments write information and a keyboard used for manual instrument control.

To manually operate a single spectrum analyzer, the display can be used as a conventional keyboard and screen.

To achieve the display in Figure 1-5:

1. Press the (DISPLAY) key.

2. Press the SELECT INSTR key.

3. Press the (MENU) key.
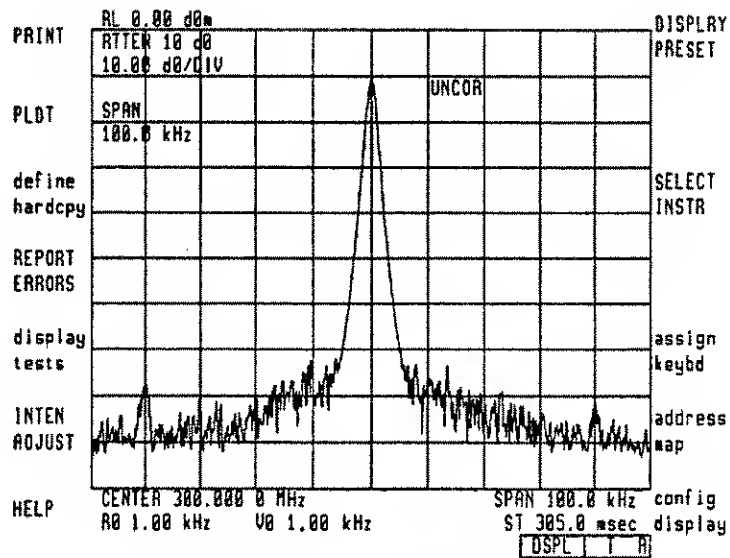
Figure 1-5. Display Capabilities

Select Instrument   SELECT INSTR establishes contact between the display and the instruments currently configured in the HP 70000 system. For more information, see the SELECT INSTR menu key description in Chapter 2.

To achieve the display in Figure 1-6:

1. Press the (DISPLAY) key.

2. Press the SELECT INSTR key.
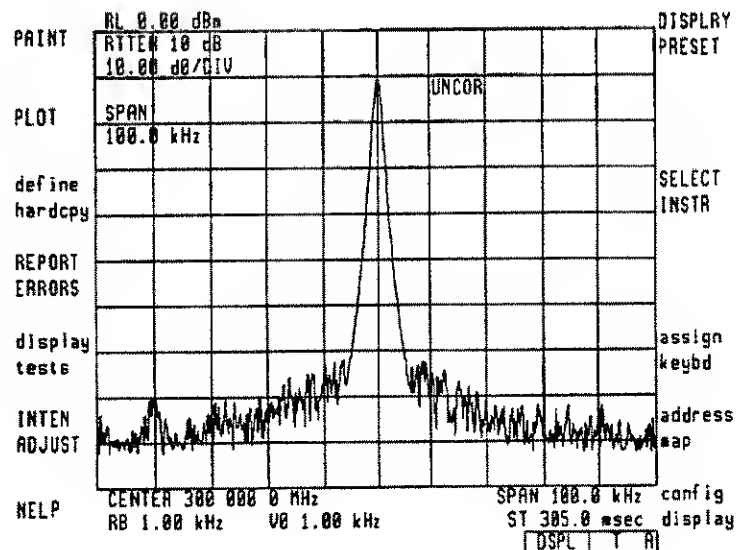
Figure 1-6. Select Instrument

Hardcopy Outputs   The display helps the user obtain hardcopy output without the need of an external controller. For more information, see the menu key descriptions in Chapter 2 for PRINT , PLOT , and define hardcpy .

To achieve the display in Figure 1-7:

1. Press the (DISPLAY) key.

2. Press the define hardcpy key.
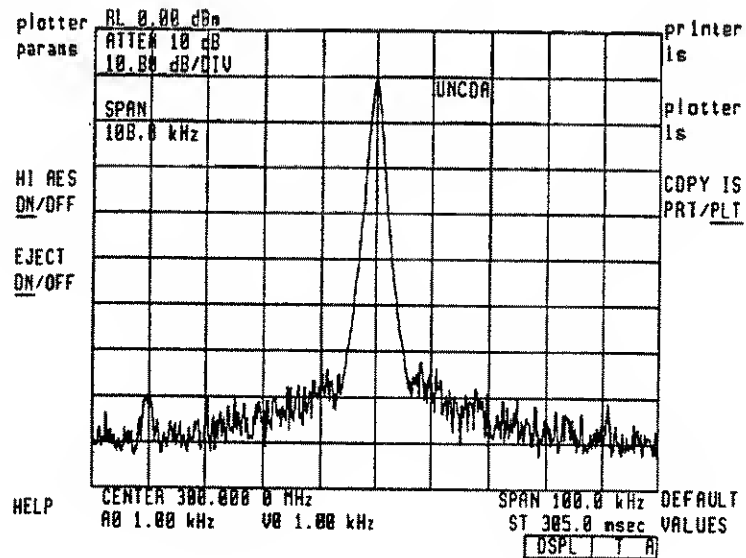
Figure 1-7. Print, Plot Capabilities

Multiple Instrument Output Capabilities

The display allows users to view output from multiple instruments simultaneously. See the config display menu key description in Chapter 2 for further instructions.

To achieve the display in Figure 1-8:

1. Press the (DISPLAY) key.

2. Press the config display key.

3. Press the build windows key.

4. Press the BUILD 2 WINDOWS key.

5. Use assign window. Refer to Chapter 2 for a description of the assign window key.
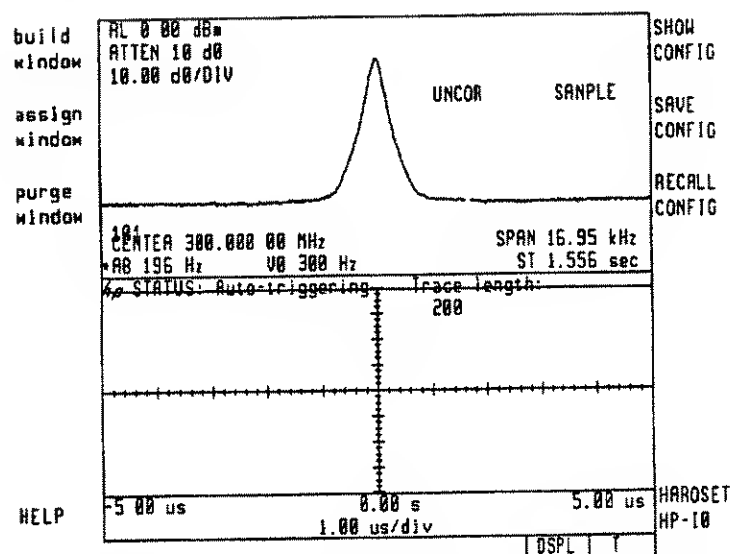
Figure 1-8. Multiple Instrument Output Capabilities

HP-IB, HP-MSIB Addressing

By means of the display, users can examine the addresses of modules on HP-IB and HP-MSIB and can change the HP-IB addresses of certain modules. (See the address map menu key description in Chapter 2 for instructions and a description of the HP-MSIB addressing scheme).

To achieve the display in Figure 1-9:

1. Press the (DISPLAY) key.

2. Press the address map key.

Figure 1-9. HP-IB, HP-MSIB Addressing

Reporting Errors   The display reports any errors detected on HP-MSIB to the user. (See the REPORT ERRORS menu key description in Chapter 2 for more information.)

To achieve the display in Figure 1-10:

1. Press the (DISPLAY) key.

2. Press the REPORT ERRORS key.

```
PRINT        │ERROR REPORT from                            │DISPLAY
             │                                             │PRESET
             │70900A,Lo/Ctlr  (Row 0, Column 18)
PLOT         │7003 70905A 5,18 Second LO unlocked
             │
define       │                                             │SELECT
hardcpy      │                                             │INSTR
             │
REPORT       │
ERRORS       │
             │                                             │assign
display      │                                             │keybd
tests        │
             │                                             │address
INTEN        │                                             │map
ADJUST       │
             │                                             │config
HELP         │              ·                              │display
             └─────────────────────────────────┤DSPL│ T E│
```
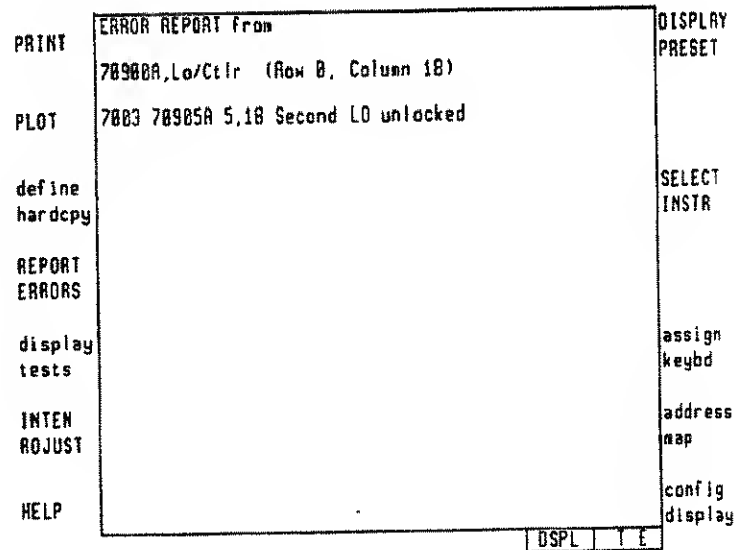
Figure 1-10. Report Errors

Help Screens   The display explains its own operation with information available under the various ▓HELP▓ menu keys.

To achieve the configuration in Figures 1-11 and 1-12:

1. Press the (DISPLAY) key.

2. Press the ▓HELP▓ menu key.

```
┌─────────────────────────────────────┐
│             KEYBOARD TEST            │
│                                      │
│ To test the keyboard, press each key.  After the key│
│ is pressed the key function/label will be displayed.│
│ Menu key #1 is the upper right menu key, menu key #8│
│ is the upper left menu key. The left arrow key exits│
│ the routine.                         │
│                                      │
│                                      │
│                                      │
│                                      │
│                                      │
│                                      │
│                                      │
│                                      │
│                                      │
│                                      │
│                                      │
│                              ┌─────┬─┐│
│                              │DSPL │T││
└──────────────────────────────┴─────┴─┘
```
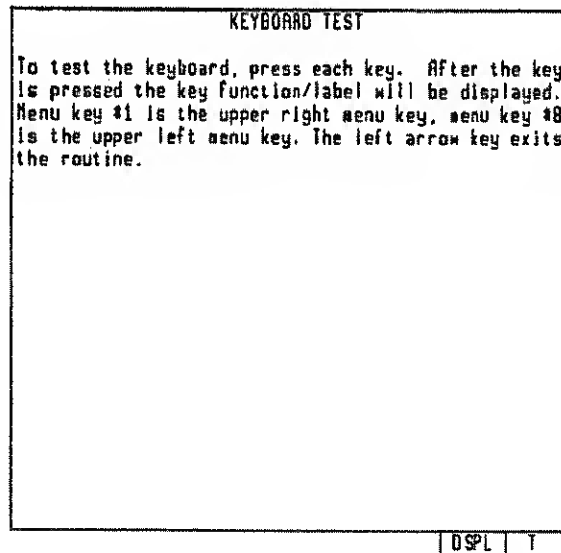
Figure 1-11. Help Screen: Page One

```
┌─────────────────────────────────────┐
│DISPLAY PRESET                        │
│  Clears  the  display  and  gives the screen to the│
│  module which currently owns the keyboard (if any).│
│  Restores the DEFINE HARDCOPY menu DEFAULT VALUES.│
│                                      │
│SELECT INSTR                          │
│  Establishes link with an instrueent  Displays data│
│  and allows the user to control the instrument with│
│  softkeys. Use ↑/↓ to select another instrument.│
│                                      │
│ASSIGN KEYBD                          │
│  Changes  keyboard  control  from  one instrument to│
│  another in a  multi-window  display.  The selected│
│  window will be highlighted         │
│                                      │
│ADDRESS MAP                           │
│  Displays a matrix  showing  all the modules on the│
│  HP70000 Modular System Interface Bus (HP-MSIB). It│
│  shows the HP-MSIB and HP-IB addresses, allows the│
│  user to change a master module HP-IB address,│
│                                      │
│ MORE                         ┌─────┬─┬─┐│
│                              │DSPL │T│A││
└──────────────────────────────┴─────┴─┴─┘
```

Figure 1-12. Help Screen: Page Two

Softkey Reference

| How to Use this Chapter | This chapter describes in detail the manual operation of the HP 70205A and HP 70206A graphics displays. All manually-available functions are accessed through keys by pressing the (DISPLAY) key. Note that the HP 70206A also makes the (PRINT) and (PLOT) functions available on keys. This chapter contains the following information: |

Softkey Index   Table 2-1 lists the menu keys alphabetically, gives the keystrokes to access them, and tells where to find more information.

Menu Tree Map   Figure 2-2 shows a graphical representation of the display's menu keys.

Softkey Functions   All menu keys are described in detail, including examples and sample outputs.

Table 2-1. Softkey Index, Alphabetical Order

Key	Description	Path			Page
address map	Activates the address-map menu.	address map			2-14
ADJUST COLUMN	Horizontally adjusts the position of a highlighted box/window on the address map/display.	address map.	ADJUST COLUMN		2-18
ADJUST ROW	Vertically adjusts the position of a highlighted box/window on the address map/display	address map.	ADJUSTS ROW		2-18
ALLOC DISPLAY	Establishes contact between the screen and keyboard, and a specific module.	address map	ALLOC DISPLAY		2-21
ALLOC KEYBD	Establishes contact between the keyboard and a specific module.	address map	ALLOC KEYBD		2-24
ALLOC SCREEN	Assigns the entire screen to a particular module.	address map	ALLOC SCREEN		2-25
ASSIGN KEYBD	Enables keyboard control over any instrument currently writing information to a window on the screen.	ASSIGN KEYBD			2-13
assign window	Activates the assign-window menu.	config display	assign window		2-30
BALL	Activates a rotating 3-D ball on the display that can have its size and speed of rotation changed by the user.	display tests	tumble figures	BALL	2-70
build window	Activates the build-window menu.	config display	build window		2-26
BUILD 2 WINDOWS	Constructs two factory-defined windows on the display.	config display	build window	BUILD 2 WINDOWS	2-27
BUILD 4 WINDOWS	Constructs four factory-defined windows on the display.	config display	build window	BUILD 4 WINDOWS	2-27
CONFID TEST	Activates a display test in which roughly 90% of the operation of the display is checked.	display tests	CONFID TEST		2-69
config display	Activates the config-display menu.	config display			2-25
CUBE	Activates a rotating 3-D cube on the display that can have its size and speed of rotation changed by the user.	display tests	tumble figures	CUBE	2-70
DEFAULT WINDOW	Specifies the default window size (same as created by select instr command).	config display	build window	DEFAULT WINDOW	2-29

Table 2-1. Softkey Index, Alphabetical Order (continued)

Key	Description	Path			Page
define hardcpy	Activates the define hardcopy menu	define hardcpy			2-49
DISPLAY ID	Activates ID screen that reports vers of disp op, dsp model #, ROM date, HP-MSIB addr, HP-IB addr, & dot gen relse code.	display tests	DISPLAY ID		2-67
display tests	Activates the display test menu.	display tests			2-67
EXECUTE	Redefines the window to the coordinates specified by the Xmin, Ymin, Xmax, and Ymax commands.	config display	huild window	EXECUTE	2-28
EXECUTE	Redefines the assignment of or purges a window that was specified hy select window, adjust column, or row commands.	config display	assign window	EXECUTE	2-30
HI RES ON/OFF	Enables/disables high resolution bardcopy on certain printers. Not available for plotter operations.	define hardcpy	EXPAND ON/OFF		2-59
HALF	Activates a rotating 3-D cone on the display that can have its size and speed of rotation changed by the user.	display tests	tumble figures	HALF	2-70
HARDSET HP-IB	Specifies the HP-IB address that the display will have when the system is turned on. Toggles with the softset HP-IB.	config display	HARDSET HP-IB	SOFTSET HP-IB	2-37
HELP	Activates a screen that contains brief descriptions of several config-display/define-hardcopy keys.	config display	HELP		2-70
HELP	Provides three pages of information about the operation of the otber top-level keys directly accessible under DISPLAY key.	HELP			2-41
HP-IB	Assigns a single window to the HP-IB address of the display.	config display	assign window	HP-IB	2-30
HP-IB L ONLY	Sets the display to expect the printer or plotter to he in listen-only status on the HP-IB.	define hardcpy	printer is	HP-IB L ONLY	2-5I
HP-IB TLK/LSN	Sets the display to expect the printer or plotter to be in talk/listen status at the HP-IB address input by the user.	define hardcpy	printer is	HP-IB TLK/LSN	2-5I
HP-MSIB COLUMN	Specifies the printer-is/plotter-is column in the address map.	define hardcpy	printer-is\plotter is	ADJUST COLUMN	2-30

Table 2-1. Softkey Index, Alphabetical Order (continued)

Key	Description	Path			Page
BP-MSIB ROW	Specifies the printer-is/plotter-is row in the address map.	define hardcpy	printer-is\plotter is	ADJUST ROW	2-52
INTEN ADJUST	Specifies or changes the intensity of the display.	INTEN ADJUST			2-70
KEY TEST	Tests the mechanical and electrical operation of every front-panel key on the display.	display tests	KEY TEST		2-69
KEYCOPY ON/OFF	Enables or disables printing or plotting of key labels, status box, and display line.	define hardcpy	KEYCOPY ON/OFF		2-56
KNOB TEST	Activates a test pattern and mode that will verify mechanical and electrical operation of the knob.	display test	KNOB TEST		2-68
MORE	Displays the next page of help information.	HELP	MORE		2-70
PLOT	Activates an HPGL plot of the display as specified by the define-hardcopy command.	PLOT			2-49
plotter is	Activates the plotter menu.	define hardcpy	plotter is		2-52
plotter params	Activates the plotter-parameters menu.	define hardcpy	plotter params		2-53
PRINT	Activates a raster-print output of the display as specified by the define-hardcpy command.	PRINT			2-48
printer is	Activates the printer-is menu.	define hardcpy	printer is		2-50
purge window	Activates the purge-window menu.	config display	purge window		2-35
RECALL CONFIG	Reconfigures the display to one of four configurations that were stored by using the save-configuration command.	RECALL CONFIG			2-45
REPORT ERRORS	Displays a report that gives a brief description of any error that has been detected by an element on the BP-MSIB.	REPORT ERRORS			2-62
ROD	Activates a rotating 3-D rod on the display that can have its size and speed of rotation changed by the user	display tests	tumble figures	ROD	2-70
SAVE CONFIG	Saves the complete configuration of the screen windows in one of four non-volatile memory registers.	SAVE CONFIG			2-45

Table 2-1. Softkey Index, Alphabetical Order (continued)

Key	Description	Path			Page
SELECT INSTR	Establishes contact between the display and an instrument currently configured in the HP 70000 system.	SELECT INSTR			2-11
SELECT WINDOW	Selects one of up to four separate windows on the display.	config display	build window	SELECT WINDOW	2-27
SELECT WINDOW	Specifies the number of the window that will be assigned or purged when the execute key is pressed.	config display	assign window	SELECT WINDOW	2-30
SET HP-IB	Soft-changes the HP-IB address of an element currently on the HP-IB if that element will permit it.	address map	SET HP-IB		2-19
SHOW CONFIG	Reports windows defined, dimensions of windows, instrument and modules to which windows and keyboard are allocated.	SHOW CONFIG			2-42
SLAB	Activates a rotating 3-D slab on the display that can have its size and speed of rotation changed by the user	display tests	tumble figures	SLAB	2-70
SOFTSET HP-IB	Specifies the HP-IB address that the display will have when the system is turned on. Toggles with hardset HP-IB.	config display	SOFTSET HP-IB	HARDSET HP-IB	2-37
test pattern	Activates test patterns in the display.	display tests	test pattern	#1 - 5	2-70
TUMBLE FIGURES	Activates the tumble-figure menu.	display tests	TUMBLE FIGURES		2-70
Xmax	Specifies the right side of window or plot when building windows/plotting.	config display	build window	Xmax	2-26
Xmin	Specifies the left side of the window or plot when building windows or plotting.	config display	build window	Xmin	2-26
Ymax	Specifies the top side of the window or plot when building windows or plotting.	config display	build window	Ymax	2-26
Ymin	Specifies the bottom side of window or plot when building windows or plotting.	config display	build window	Ymin	2-26

Softkey Functions

Introduction

This section describes in detail all tbe keys, including examples. All functions are accessed througb keys by pressing the $\boxed{\text{DISPLAY}}$ key. Note that the HP 70206A also makes functions available on keys. In addition, a brief discussion is included on the addressing of modules on (Hewlett-Packard Interface Bus) HP-IB and (Hewlett-Packard Modular System Interface Bns)HP-MSIB.

$\boxed{\text{DISPLAY}}$ is a top-level key that allows tbe user access to the entire menu of display keys. Keys in the display menu enable the user to format and obtain hardcopy output (PRINT, PLOT, and define hardcpy), to configure tbe display screen into individually assignahle windows (config display), and to access any of several instruments in the HP 70000 Modular Measurement System quickly (via SELECT INSTR and assign keybd). Furtbermore, system-wide error reporting is availahle through the display (REPORT ERRORS), as well as several display self-test features (under display tests). A display preset (DISPLAY PRESET) is availahle that clears the display and gives the screen to the module which last owned the keyboard (if any).

In addition, all addressing on the HP-MSIB can he examined via tbe address map key. The display screen's intensity can be changed (INTENS ADJUST), and some brief key descriptions are availahle under HELP.

Top Level Softkeys

Figure 2-1 is a graphical representation of tbe keys accessed at various levels under $\boxed{\text{DISPLAY}}$. Tbe 14 boxes at tbe top of Figure 2-2 represent the keys shown in Figure 2-1. This chapter describes the operation of all keys shown in the menu tree diagram.
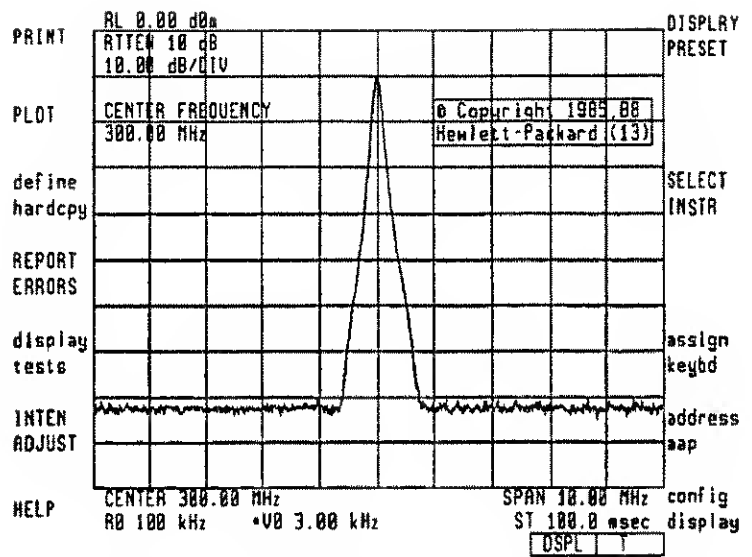
Figure 2-1. Top Level Menu for the (DISPLAY) Key

Figure 2-2. Key Menu Tree

define
hardcopy

plotter
params

KEYCOPY
ON/OFF

HI RES
ON OFF

EJECT
ON OFF

HELP

printer
is

plotter
is

COPY IS
PRT/PLT

DEFAULT
VALUES

plotter
params

Xmin

Ymin

Xmax

Ymax

printer
is

HP-MSIB
COLUMN

HP-MSIB
ROW

HP-IB
TLK/LSN

HP-IB
L ONLY

plotter
is

HP-MSIB
COLUMN

HP-MSIB
ROW

HP-IB
TLK/LSN

HP-IB
L ONLY

Figure 2-2. Key Menu Tree (continued)

Figure 2-2. Key Menu Tree (continued)

Figure 2-2. Key Menu Tree (continued)

config display → **build window** / **assign window** / **purge window** / **HELP**
SHOW CONFIG / SAVE CONFIG / RECALL CONFIG / SOFTSET HP-IB / HARDSET HP-IB

build window → BUILD 1 WINDOW / BUILD 2 WINDOWS / BUILD 4 WINDOWS / HELP
SELECT WINDOW / Xmin / Ymin / Xmax / Ymax / DEFAULT WINDOW / EXECUTE

assign window → SELECT WINDOW / HP-MSIB COLUMN / HP-MSIB ROW / HP-IB / EXECUTE

purge window → SELECT WINDOW / EXECUTE

Figure 2-2. Key Menu Tree (continued)

Display Preset

The DISPLAY PRESET key clears the screen, resets all HP-IB and window parameters to an initial state, and assigns the entire screen to the last module to own the keyboard (if none own the keyboard, the screen is left blank). It also resets the hardcopy parameters to their default values. See define hardcopy.

Select Instrument

The display works by establishing links to instruments. For example, in the spectrum analyzer, the display tries to establish a link with the local oscillator. The SELECT INSTR key establishes a link between the display and one instrument in the currently configured HP 70000 Modular Measurement System (for example, any of several spectrum analyzers). These links are required for data display and manual control of an instrument, since the display serves as the interface between that instrument and the user.

At power-on, the user is prompted to press SELECT INSTR. If, during a previous session, SELECT INSTR had been pressed and the screen assigned to an instrument, the display will automatically attempt to reestablish a link to that instrument. In that case, as soon as the link is established, the power-up prompt will go away. In most cases, this will happen so soon after the link is offered that the prompt will flash on the screen and be gone.

To establish (or reestablish) a link to an instrument, press (DISPLAY) and SELECT INSTR. If the display does not have a link to an instrument, it will look for the instrument with 0 row address, with the lowest column address on the HP-MSIB and allocate the entire screen and the 14 keys to that instrument. If a link already exists, the display will select the instrument with the next-highest address (for which the sequence goes.... 28, 30, 0, 1, 2....). Then the ⬆ (or SELECT INSTR again) and ⬇ keys can be used to select the instrument with the next highest or next lowest address.

The information displayed depends on the specific instrument selected. Since this key only establishes communication links between the display and the instrument, most instrument settings are unaffected when an instrument is selected. However, any previously defined display windows are erased.

The SELECT INSTRUMENT key is useful for establishing initial contact with a single instrument. To preserve existing windows, use the assign window key instead, available under config display. (These keys are described in detail in the CONFIG display subsection of this chapter.)
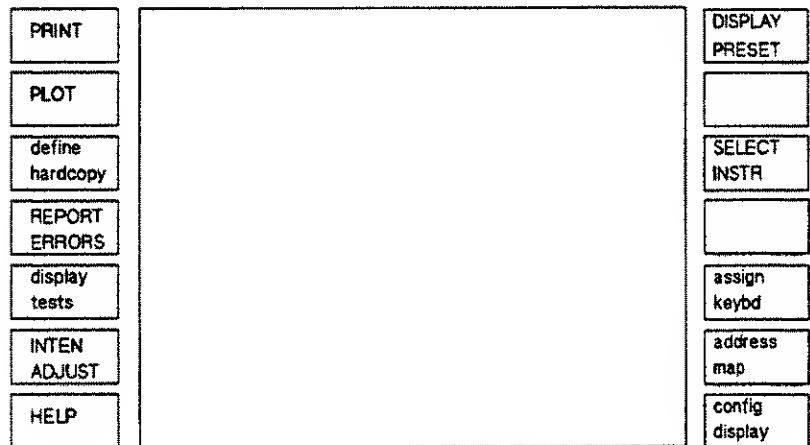
EXAMPLE: Obtain spectrum analyzer display and keyboard control.

This example describes how the user can quickly obtain a spectrum analyzer display on the screen regardless of the current screen configuration.

It begins by breaking contact with the instrument, then reestablishes contact using the SELECT INSTR keys.

1. Press (DISPLAY).

2. Press DISPLAY PRESET.

3. Press config display.

4. Press purge window.

5. Press EXECUTE.

6. Press (DISPLAY). This should result in a screen similar to Figure 2-3.

```
PRINT                                          DISPLAY
                                               PRESET

PLOT

define                                         SELECT
hardcpy                                        INSTR

REPORT
ERRORS

display                                        assign
tests                                          keybd

INTEN                                          address
ADJUST                                         map

HELP                                           config
                                               display
                                  DSPL
```

Figure 2-3.
Obtaining Spectrum Analyzer Display and Keyboard Control

If you press (USER), even the key labels disappear. No key other than (DISPLAY), (PRINT), or (PLOT) will give a response.

(USER) does not call up any keys because an instrument is not currently linked to the display. All keys under (USER) and (MENU) are created by and responded to by an instrument (such as the spectrum analyzer), while all keys under (DISPLAY) are generated by the display itself.

To obtain an instrument display on the screen, press (DISPLAY), and then SELECT INSTR. If using a spectrum analyzer, this should result in a display similar to Figure 2-4. To use the instrument now, simply press (USER) or (MENU) and use the appropriate keys.
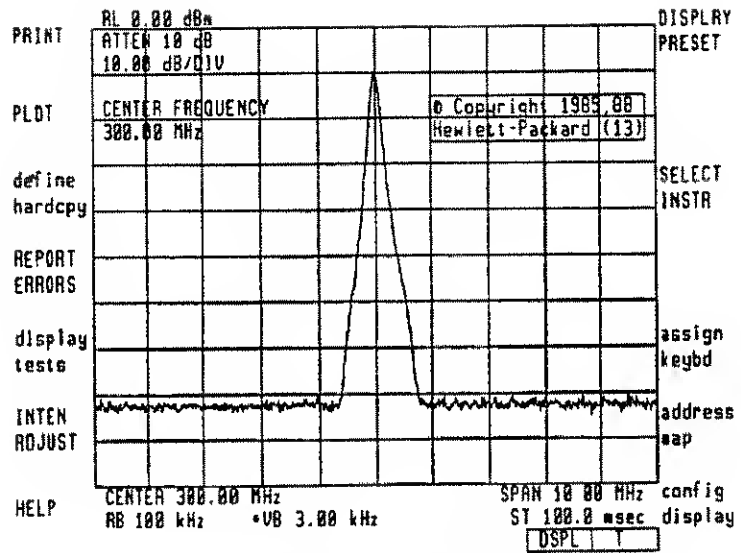
Figure 2-4. Instrument Display

Assign Keyboard

This key gives the user keyboard control over any instrument currently writing information to a window on the screen.

To use this key, press (DISPLAY) and ▓assign keybd▓, then use the step keys, the display knob, or the numeric keypad to select the window desired (for example, the window written to by the instrument you wish to control). If it is defined, the window corresponding to the number chosen (1 through 4) will be highlighted on the screen. Next press (MENU) or (USER), and the specified instrument will respond with the appropriate key menu. A communication link between the keyboard and the module is established when the user leaves the (DISPLAY) function (for instance, by pressing (MENU) or (USER)).

EXAMPLE: Build two windows, one atop the other.

Use ▓assign keybd▓ to control separate instruments, both simultaneously writing to the display. (If you have already read ▓assign window▓ and ▓BUILD 2 WINDOWS▓, and if you have two instruments in your system, try this example. If not, refer to the "Configure Display" section in this chapter.)

1. Press ▓config display▓.

2. Press ▓build window▓.

3. Press ▓BUILD 2 WINDOWS▓.

4. Assign each window to a different instrument in the system, so that the display screen is similar to Figure 2-5.

5. Press (DISPLAY), ▓assign keybd▓.

6. Use the step keys until the bottom window is highlighted on the screen.

7. Press (MENU) or (USER).
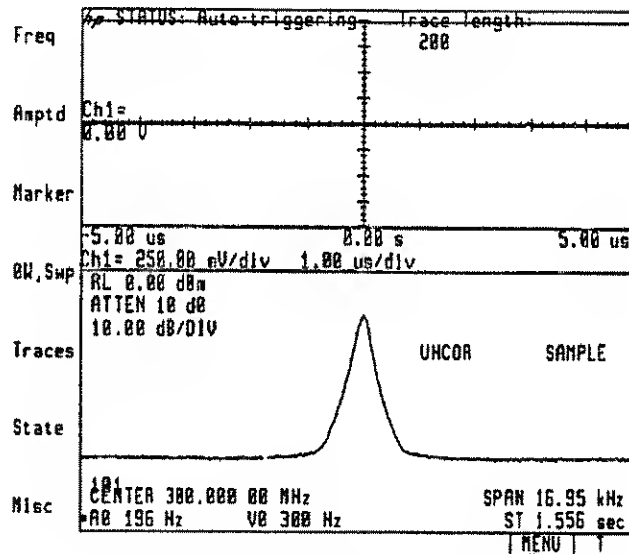
Figure 2-5. Assigning the Keyboard

You now have access to the basic instrument control keys of the instrument writing to the bottom window. In this figure, the user pressed (MENU), (FREQ), then SPAN. Note that SPAN 100 kHz is denoted as the active function.

assign keybd and ALLOC KEYBD (under address map) both link the keyboard with an instrument or module. They differ in the method by which the instrument to be controlled is selected. Both link the keyboard to a module: assign keybd by selection of a window in the display, ALLOC KEYBD by moving the cursor in the address map.

Address Map   The address map key allows you access to the address map. The address map is a real-time graphical representation of the HP 70000 system elements, modules and graphics displays, that are on HP-MSIB.

```
      |        |          |        |        | ADJUST
  7   |        |          |        |        | COLUMN
      |        |          |        |        |
  6   |        |          |        |        | ADJUST
      |        |          |        |        | ROW
  5   |        |          |        |        |
      |        | 70900A   |        |        | SET
  4   |        | RF SECT  |        |        | HP-IB
  3   |        | 70903A   |        |        | ALLOC
      |        | IF SECT  |        |        | DISPLAY
  2   |        |          |        |        |
      |        | 70902A   |        |        | ALLOC
  1   |        | IF SECT  |        |        | KEYBD
      |        | 70900A   |        |        | ALLOC
  0   |        | Lo/Ctlr  |        |        | SCREEN
      |        | HP-IB 18 |        |        |
        17        18         19       20
                  COLUMN

COLUMN:  18                        [DSPL   ]
```

Figure 2-6. Typical HP 70000 Address Map Detail

The operation of individual keys under address map is described in the following pages. In this subsection we will briefly discuss the concept of the HP 70000 Modular Measurement System address map, HP-MSIB, and the capabilities accessible via the address map key. More information about HP-MSIB is available in the Installation and Verification Manual for your instrument, which is the primary user reference for addressing modules.

HP-MSIB has a two-dimensional addressing scheme. Each system element, such as the HP 70900B Local Oscillator module or the HP 70206A System Graphics Display, has a two-part bus address. The address consists of a row number and a column number (for example, row 0, column 18). This unique address serves as an identifier so that any element can talk with any other element on HP-MSIB, regardless of physical proximity or other bus traffic.

The address map is designed so that each element can be located by its unique address. The row address (first number) specifies the horizontal row of the grid where the element is located, and the column address specifies the vertical column. Rows have numbers 0 through 7 (0 is at the bottom of the screen) and columns are numbered 0 through 31 (0 is at the left edge of the map). The address 0, 31 is not available for use; hence, there are 255 available addresses.

Each modular measuring instrument (composed of several modules) will typically occupy all or part of a single column. The exception to this is multi-column instruments. See the Installation and Verification Manual for your instrument. Note that the display elements (HP 70205A and the larger HP 70206A) are *not* part of any measuring instrument. Each display serves as a general-purpose human-machine interface, providing a screen for the instruments and

keys that enable the user to control the system. Since the displays are not part of any particular instrument, each will occupy its own column in the address map. The display must he located in a column other than the instrument that it is linked to. See the figures helow.

```
                                                          ADJUST
  7 |        |          |          |          |           COLUMN
    |--------|----------|----------|----------|          ────────
  6 |        |          |          |          |           ADJUST
    |        |          |          |          |           ROW
  5 |        | 70905A   |          |          |
    |        | RF SECT  |          |          |
  4 |        |          |          |          |           SET
R   |        |          |          |          |           HP-IB
O 3 |        |          |          |          |
W   |        |          |          |          |           ALLOC
  2 |        | 70903A   |          |          |           DISPLAY
    |        | IF SECT  |          |          |
  1 |        | 70902A   |          |          |           ALLOC
    |        | IF SECT  |          |          |           KEYBD
  0 |        | 70900A   |          |          |
    |        | Lo/Ctlr  |          |          |           ALLOC
    |        | HP-IB 18 |          |          |           SCREEN
      17         18         19         20
                    COLUMN

COLUMN:  18                          [ DSPL     T ]
```

Figure 2-7. Addressing Conventions for Individual Elements

```
                                                          ADJUST
  7 |        |          |          |          |           COLUMN
    |--------|----------|----------|----------|          ────────
  6 |        |          |          |          |           ADJUST
    |        |          |          |          |           ROW
  5 |        |          |          |          |
    |        |          |          |          |           SET
  4 |        |          |          |          |           HP-IB
A   |        |          |          |          |
D 3 |        |          |          |          |           ALLOC
W   |        |          |          |          |           DISPLAY
  2 |        |          |          |          |
    |        |          |          |          |           ALLOC
  1 |        |          |          |          |           KEYBD
    |        | 70206A   |          |          |
  0 |        | DISPLAY  |          |          |           ALLOC
    |        | HP-IB 4  |          |          |           SCREEN
       3          4         5          6
                    COLUMN

COLUMN:   4                          [ DSPL     T   A ]
```

Figure 2-8. Addressing Conventions for the Display

HP-MSIB addresses are set only by switches located on each module or display. All elements (modules and HP 70206A displays) have

adjustahle column addresses. All elements except the displays have adjustahle row addresses. (The displays are confined to row 0.) An appropriate element, when located in row 0, acts as a master to all modules ahove and to the right of it; this master has control as far as the column of the next master. The master module is ahle to control another module hy ordering it to perform tasks and hy controlling the flow of information to and from that module. For example, an error detected in an IF section will be reported to the master module, which will in turn report it to the user via the display. (In a spectrum analyzer, the master module is the local oscillator.)

The modules controlled by a master are referred to as slaves. Slave modules are addressed ahove the master; that is, slaves have'higher row addresses than their master. A measuring instrument such as a spectrum analyzer will typically consist of one master (local oscillator module) and several slaves (IF sections, RF front-end sections, tracking generators, and so on). While a master module must be located in row 0, slave modules can he addressed in any of several rows.

HP-MSIB addresses must he unique. Setting two HP 70000 elements to the same address will create an error and make the HP-MSIB inoperative. If the cursor cannot he moved ahout within the address map after a module has heen readdressed, check to see if two modules have the same row and column address. If so, removal of the modules is required. See the Installation and Verification Manual for your instrument for instructions. If HP-MSIB is inoperative at power-up, all modules will indicate this hy hlinking their error LED (the display hlinks its E annunciator). To test for an inoperative HP-MSIB, cycle power and check the E annunciator.

HP-IB, HP-MSIB, and the Address Map

Although HP-IB and HP-MSIB are different huses, some elements on HP-MSIB are accessihle via HP-IB. Specifically, certain elements that have an the HP-MSIB row address of 0 may he addressed over HP-IB with the proper configuration.

A hrief discussion of HP-IB usage with HP 70000 systems will he presented here, but a more detailed coverage is given in the Installation and Verification Manual for your instrument.

Between mainframes (HP 70001A), HP-IB and HP-MSIB are completely separate and are carried on separate cables. HP-IB is a parallel-connected single cable bus; HP-MSIB is a series-connected dual-cahle hus. Two HP 70000 Series mainframes are connected to the same HP-IB network only if each is connected to it individually, or if there is an HP-IB cahle linking the two. HP 70206A also is connected to the system over separate HP-IB and HP-MSIB cables.

Within a single mainframe, HP-IB and HP-MSIB connections are carried along the backplane hus and are provided at the hack of each 1/8-width module slot. A mainframe has exactly one HP-IB port (one connector) and one HP-MSIB port (two connectors: one IN and

one OUT). Hence, all modules in a particular mainframe have access to both HP-IB lines and HP-MSIB lines.

All modules can communicate over HP-MSIB, but, as previously mentioned, only certain modules or elements can talk over HP-IB. Therefore, while every HP 70000 Series element takes up an HP-MSIB address, only the row 0 modules can occupy HP-IB addresses. Among HP 70000 series elements that can use HP-IB are HP 70900B Local Oscillator and HP 70205A and HP 70206A graphics displays.

Each system element that can talk over HP-IB can also be removed from HP-IB by positioning the HP-IB ON/OFF switch in the OFF position (Some modules indicate by this putting a NO in the address map in place of their HP-IB address). On the displays, this switch is readily accessible from the back panel. On the HP 70900B Local Oscillator, the switch is located on the top of the module, along with the other HP-IB and HP-MSIB switches. Changing any of these switches on the local oscillator requires removal of the module from the mainframe. See the Installation and Verification Manual for your instrument for more information.

| Note | HP-IB address and HP-MSIB address of a system element are not necessarily related. |

HP-MSIB address is determined solely by the setting of the address switches on the module (refer to the Installation and Verification Manual for your instrument). When applicable, HP-IB address of each module defaults to the HP-MSIB column address. For example, HP-MSIB address 0, 18 has a default HP-IB address of 18. Note, however, that HP-IB address of the local oscillator and of both displays may be set to any valid address using the SET HP-IB key, which is available through the address map key. See the SET HP-IB key description in this chapter for instructions.

Adjust Column and Adjust Row

The ADJUST COLUMN and ADJUST ROW keys, available directly under address map, allow you to move the cursor (the highlighted box) within the address map.

EXAMPLE: Adjust the column and row.

1. Press (DISPLAY).

2. Press address map.

3. Press ADJUST COLUMN.

4. Turn the display knob until the cursor rests on the local oscillator module.

5. Press ADJUST ROW.

6. Use the ⬆ key to place the cursor on the RF section as in Figure 2-9.

Figure 2-9. Adjusting Column and Row

The ADJUST COLUMN and ADJUST ROW keys accept data entry from the display knoh, from the ⬆ and ⬇ keys, and from the nnmeric key pad.

The module currently highlighted in the address map will have a green "ACT" light on its front panel. (The displays show an A in the lower right-hand status box on the screen.) This light enables you to correlate the specific physical HP 70000 Series elements to their locations in the address map.

Set HP-IB

The SET HP-IB key allows you to change HP-IB address of any element currently on HP-IB if that element will permit it. The specific conditions are discussed earlier in this section.

EXAMPLE: Change HP-IB address of the display.

1. Press DISPLAY.

2. Press address map.

3. Press ADJUST COLUMN.

4. Turn the display knob so that the cursor hox stops on the display as in Figure 2-10.

Figure 2-10. Adjust Coiumn

5. Press SET HP-IB.

6. Press ⌈ 2 ⌉.

7. Press ⌈ 0 ⌉.

8. Press ENTER. HP-IB address of the display should immediately change to 20 as in Figure 2-11.

Figure 2-11. Setting HP-iB

An HP 70000 Series element can show an HP-IB address on the address map even though the element is disabled (by HP-IB switch) and cannot communicate on HP-IB. See HP-MSIB earlier description in this section, or see the Installation and Verification Manual for your instrument. Some modules show that they are disabled by replacing their HP-IB address with the word "NO" in the address map.

HP 70900B Local Oscillator module has the ability to lock its HP-IB address so it will not respond to the SET HP-IB key. To do this set the "SW1/MEM" switch on the LO to the "SW1" position. With this switch set to "SW1", HP-IB address of the LO will remain identical to the HP-MSIB column address.

Upon power-up, HP-IB addressing is handled differently by different elements. Displays can be configured to have a power-up HP-IB address of either the HP-MSIB column address or the most recent HP-IB address given to the display with the SET HP-IB key. This option (for displays only) is discussed in the HARDSET/SOFTSET HP-IB section of this chapter. The local oscillator module, however, always has a power-up HP-IB address identical to its HP-MSIB column address.

Allocate Display

The key ALLOC DISPLAY is used to establish contact between the display and a specific module. ALLOC DISPLAY allocates the screen and keys to the module currently highlighted by the cursor in the address map.

EXAMPLE: Allocate the display to a particular instrument.

First, break contact with the spectrum analyzer.

1. Press (DISPLAY).

2. Press address map.

3. Press ADJUST COLUMN.

4. Use the display knob to place the cursor on an empty address, as in Figure 2-12. (On the display screen the cursor is the highlighted box.)

```
                                              ADJUST
        7                                     COLUMN
        6                                     ADJUST
                                              ROW
        5
                                              SET
     R  4                                     HP-IB
     O
     W  3                                     ALLOC
                                              DISPLAY
        2
                                              ALLOC
        1                                     KEYBD

        B                                     ALLOC
                                              SCREEN
            12      13      14      15
                        COLUMN

     COLUMN:  13                        [DSPL| T  ]
```

Figure 2-12. Allocating the Display to an Instrument

5. Press `ALLOC DISPLAY`.

This breaks all links with the existing instrument and attempts to establish a link between the display and a nonexistent instrument. This results in a blank screen, as in Figure 2-13.

```
     PRINT                                    DISPLAY
                                              PRESET

     PLOT

     define                                   SELECT
     hardcpy                                  INSTR

     REPORT
     ERRORS

     display                                  assign
     tests                                    keybd

     INTEN                                    address
     ADJUST                                   map

     HELP                                     config
                                              display
                                        [DSPL| T  A]
```

Figure 2-13. Blank Screen

Reestablish contact with the spectrum analyzer.

1. Press `address map`.

2. Press ADJUST COLUMN.

3. Turn the knob to position the cursor on the local oscillator module.

Figure 2-14. Cursor on Local Oscillator Module

4. Press ALLOC DISPLAY.

5. Press (MENU) to see the module's keys.

This should result in a screen similar to that shown in Figure 2-15, depending on the previous settings of the spectrum analyzer being used.
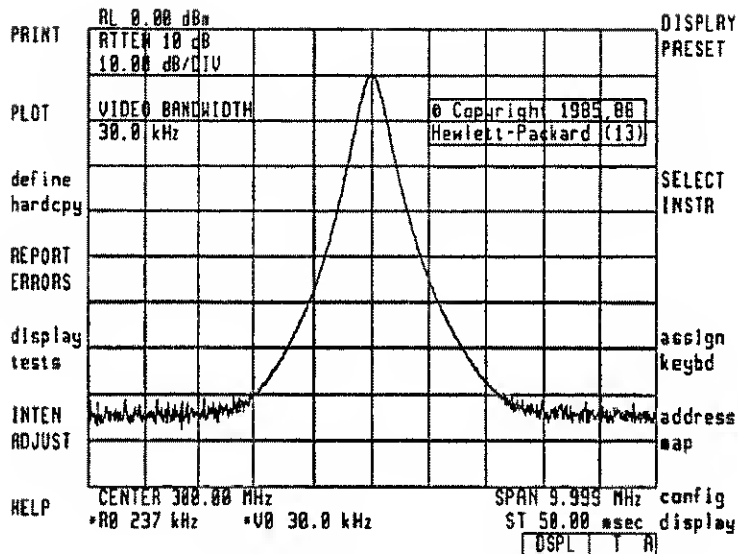
Figure 2-15. Allocated Display

In snmmary, ALLOC DISPLAY establishes contact between the display (the user interface) and an HP 70000 module, but differs from SELECT INSTR. ALLOC DISPLAY, used in the address map, requires that a particular module (element) he specified. SELECT INSTR selects an instrument on its own. Both, however, destroy any links between the display and any other instruments. Both destroy any existing windows in the display.

Allocate Keyboard

The ALLOC KEYBD key is used to allocate the keyboard to a specific module. The keyboard can then be used to control the instrument settings of a spectrum analyzer, such as center frequency and span.

1. Press (DISPLAY).

2. Press address map.

3. Move the cursor to the module desired.

4. Press ALLOC KEYBD and (MENU) to se the module's keys.

The keyboard will be linked to that module.

The keyhoard and the screen can be allocated separately. ALLOC KEYBD links the keyboard with an instrument, hut does not necessarily display any trace data from that instrument. Hence, the keys may not correspond to the instrument display shown.

Only a master module, such as HP 70900B Local Oscillator, can establish a link with the keyboard. Attempts to allocate the keyboard to slave modules will result in an error.

ALLOC KEYBD lets the user link the keyboard with any master module by way of the address map. Another key, assign keyboard, which is available directly under (DISPLAY), is generally quicker and easier to use.

Allocate Screen

The two resources of the display, the keyboard and the screen, can be allocated separately. ALLOC SCREEN assigns the whole screen to a particular module, even though the keyboard may he assigned elsewhere. This allows the user to view the trace output from one instrument (on the screen) while controlling a different instrument (with the keyhoard).

To use the ALLOC SCREEN key:

1. Press address map.

2. Move the cursor box to the module or instrument desired.

3. Press ALLOC SCREEN and the screen will he immediately allocated to that module. If the module is ready to put out trace information, the information will be immediately displayed.

| Note | Only master modules can he linked to the display. Therefore, use ALLOC SCREEN only for master modules, such as the HP 70900B Local Oscillator module. Attempting to allocate the screen to a slave module will result in an error. |

Configure Display

config display gives the user access to a submenu of keys that configure the various features of the display. See Figure 2-16. These features and capahilities consist of huilding windows on the screen, selecting the instruments that may write to those windows, saving and recalling display configurations, and viewing stored and current configurations.
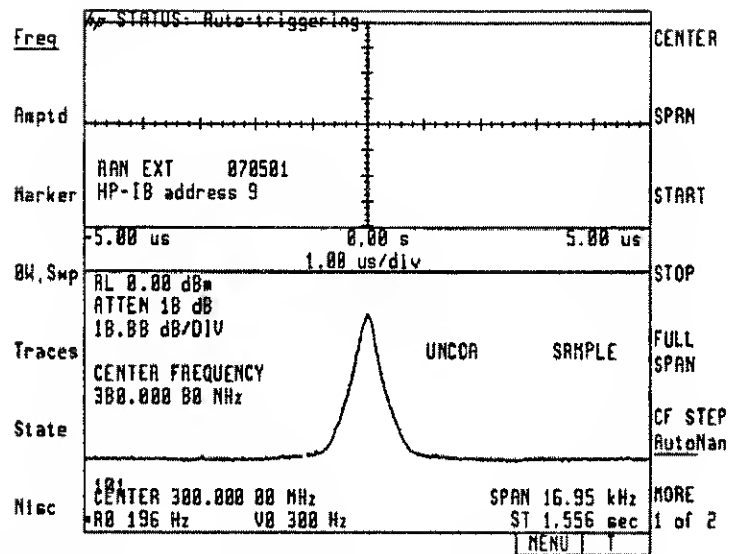
Figure 2-16. Configuring Display

The keys accessed by pressing config display include build window, assign window, purge window, HELP, SHOW CONFIG, SAVE CONFIG, RECALL CONFIG, and HARDSET/SOFTSET HP-IB. The following pages contain descriptions and examples of these keys. A listing and brief description of each follows:

- build window allows the user to construct up to four separate windows on the screen.

- assign window links windows with modules so that trace information can be displayed.

- purge window removes a previously built window.

- HELP calls up some brief descriptions of the keys available under config display.

- SHOW CONFIG displays a summary of the current and stored display screen configurations.

- SAVE CONFIG, RECALL CONFIG save and recall a screen configuration to or from one of the four screen configuration registers.

- HARDSET/SOFTSET HP-IB allows the user to determine the power-up HP-IB address of the display.

Build Window

The build window key allows the user to construct up to four separate windows on the screen. A window is a user-defined portion

of the screen that is set aside for a single instrument to display information.

EXAMPLE: Build two windows.

Note ☝ The BUILD 1 WINDOW , BUILD 2 WINDOWS , and BUILD 4 WINDOWS keys perform a similar function.

1. Press (DISPLAY).

2. Press config display .

3. Press build window .

The build window submenu appears with SELECT WINDOW antomatically underlined as in Figure 2-17. The underline indicates that this function is active. Select a window, numbered 1 through 4, by using any data entry method (step keys, display knob, numeric keypad, or key). If the key pad is used to enter the window number, the user must press ENTER to finish the entry.

For this example, build window #1.

Note ☝ The window selected, if currently defined, is highlighted.
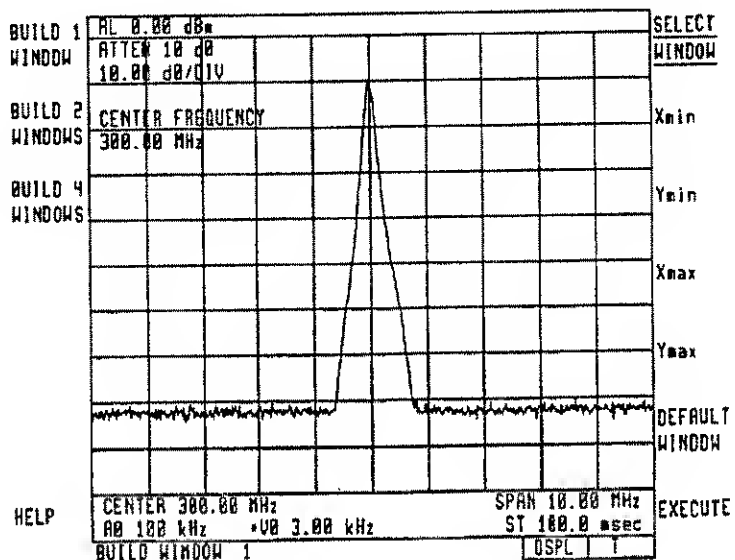
Figure 2-17. Build Window #1

Press Ymax, then turn the knob counterclockwise to bring the top line to a point just below the middle of the screen. At the bottom of the screen a Ymax value will be displayed and will change as

the display knob is turned. Set Ymax to approximately 195. Press
EXECUTE. Window #1 has now been redefined as in Figure 2-18.

1. Press the assign window key.

2. Press the HP-MSIB key.

3. Press the EXECUTE key.
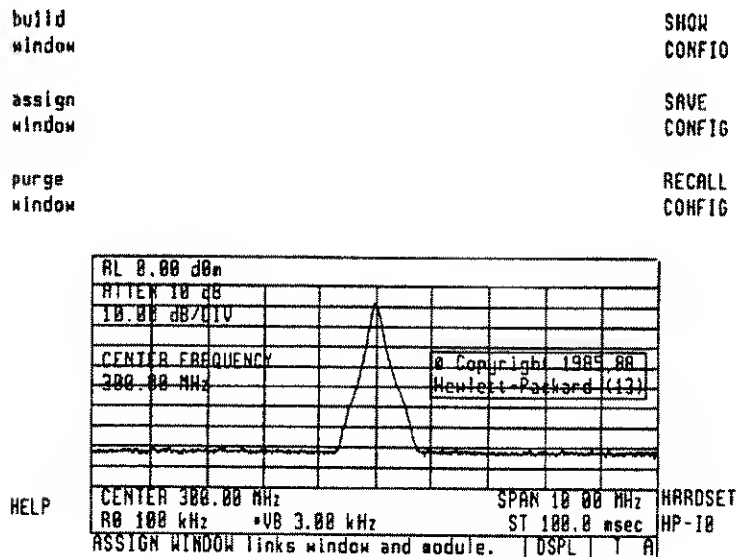
Figure 2-18. Build Window #2

1. Press build window.

2. Press SELECT WINDOW.

3. Press (1).

4. Press ENTER.

5. Press Ymin.

6. Using the display knob, move the bottom line to a position just above the other window (Ymin=205).

7. Press EXECUTE.

Two windows are now defined as in Figure 2-19. Each window could be assigned to different instruments if desired. See assign window description. See the purge window description to remove the windows.
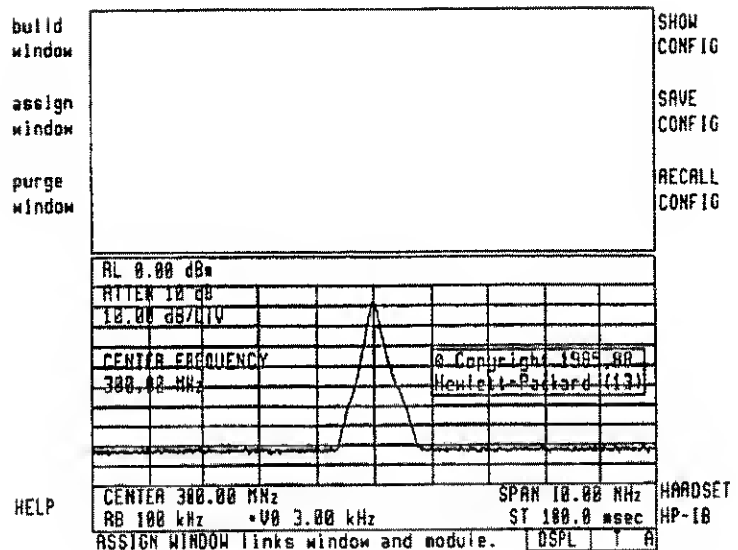
Figure 2-19. Windows #1 (top) and #2 (bottom)

The values of Xmin, Ymin, Xmax, Ymax represent the distances of the lines from the origin. The origin (X = 0, Y = 0) is located at the lower left corner of the screen. The top right corner of the screen is X = 1023, Y = 383. These dimensions are in display units (units of dots on the screen).

The standard-size window, available via DEFAULT WINDOW, has the following dimensions:

Xmin = 112

Ymin = 16

Xmax = 911

Ymax = 383

The default window is the window which is created by SELECT INSTR, ALLOC DISPLAY, ALLOC SCREEN, DISPLAY PRESET, and BUILD 1 WINDOW.

1. Any window can he changed in size or shape hy rehuilding. Up to four windows may he defined and written to simultaneously by different instruments; thus, four different instruments can "talk" to the display simultaneously. The screen annotation usually present with one or two large windows may not appear on smaller windows.

2. The keys BUILD 1 WINDOW, BUILD 2 WINDOWS, and BUILD 4 WINDOWS can be used to construct multiple windows with a single keystroke.

3. The DISPLAY PRESET or SELECT INSTR keys will return the display to a single full-screen window.

Assign Window

A window on the screen can be written to by any HP-MSIB master module (for example, the HP 70900B Local Oscillator) or by an HP-IB controller. assign window lets the user select the instrument that will write to a chosen window. The user can select a module on HP-MSIB by using HP-MSIB COLUMN , HP-MSIB ROW , and EXECUTE . See the following example.

Alternatively, a window may be accessed over HP-IB. To do this, press assign window , select the window, then press HP-IB and EXECUTE . The window will then have HP-IB address of the display. See address map to determine HP-IB address of the display. Only one display window at a time can be assigned to HP-IB. HP-IB can also operate without an explicitly defined window, since it automatically receives the default window at power-up (if HP-IB is not assigned a window, one does not show up in SHOW CONFIG).

EXAMPLE: Build two windows and assigning one to an instrument.

1. Clear the screen of all windows. See purge window .

2. Build two windows as in the build window example, leaving the screen with two blank, unassigned windows as in Figure 2-20. The lower window should be number 1 and the upper window should be number 2.
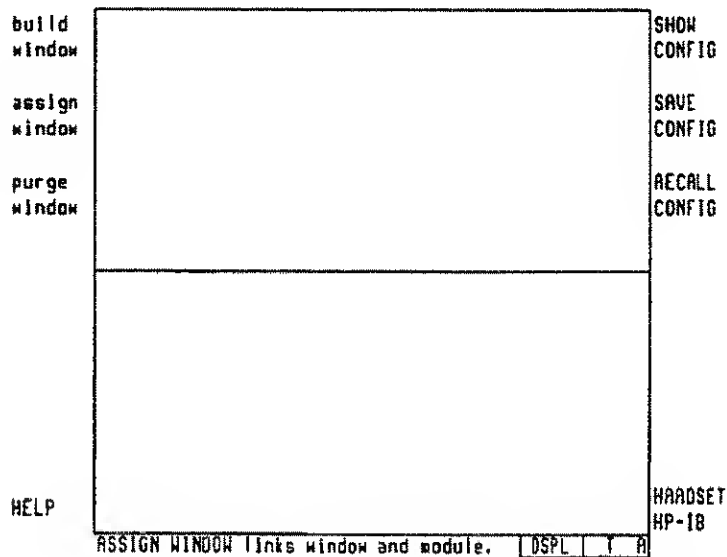
Figure 2-20. Building Two Windows

1. Press assign window , SELECT WINDOW , ⬚, and ENTER . The lower window should be highlighted.

2. Press HP-MSIB COLUMN and turn the knob until the bottom line
   on the screen shows that an HP 70900B Local Oscillator module
   has been found, as in Figure 2-21 (the factory default address is
   0,18).

	SELECT WINDOW
	HP-MSIB COLUMN
	HP-MSIB ROW
	HP-IB
	EXECUTE

ASSIGN WINDOW 1 to Row 0 Column 18 70900A,Lo/Ctlr
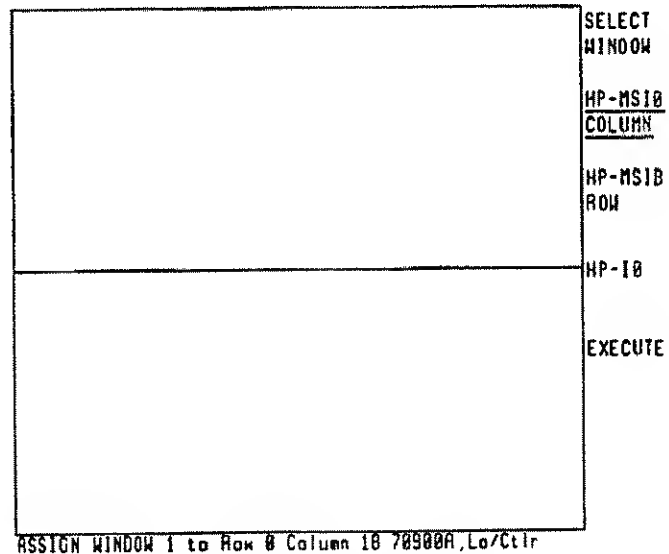
Figure 2-21. Building the First Window

1. Press EXECUTE. The trace output from that measurement
   instrument should appear in the window as in Figure 2-22.

build window		SHOW CONFIG
assign window		SAVE CONFIG
purge window		RECALL CONFIG
	RL 0.00 dBm	
	ATTEN 10 dB	
	10.00 dB/DIV	
	CENTER FREQUENCY	© Copyright 1989,90
	300.00 MHz	Hewlett-Packard (13)
HELP	CENTER 300.00 MHz SPAN 10.00 MHz	HARDSET
	RB 100 kHz •VB 3.00 kHz ST 100.0 msec	HP-IB
	DSPL T A	
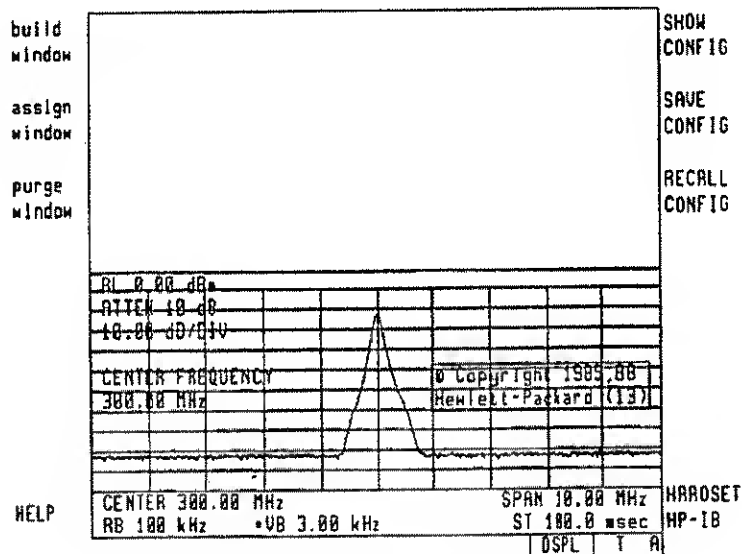
Figure 2-22. Assigning the First Window

The keys appearing now are those of the display.

To access the key menu for control of the measurement instrument, press (MENU) or (USER).

To control a different instrument, use `assign keybd` to link the keys with a master module that has a window. `assign keybd` is available directly under the (DISPLAY) key.

EXAMPLE: Assign the other window to an instrument.

If your system contains only one instrument, then the second window can he assigned to it. This will result in the instrument's trace information shifting to the second window, which demonstrates the flexibility of the windowing capabilities. This also demonstrates that an instrument can be reassigned to another window from the front panel withont changing any instrument settings or interrupting the sweep sequence. Note that the instrument only writes to one window at a time.

1. Press `assign window`

2. Press `SELECT WINDOW`

3. Use the step keys to select the other window (the window that is presently blank).

4. Press `HP-MSIB COLUMN`.

5. Turn the knoh until the HP 70900B Local Oscillator module is indicated at the bottom of the screen.

6. Press `EXECUTE`, and the display should shift to the other window, as in Figure 2-23.

With only one instrument writing to the display, the instrument keys will be immediately available hy pressing (USER) or (MENU)
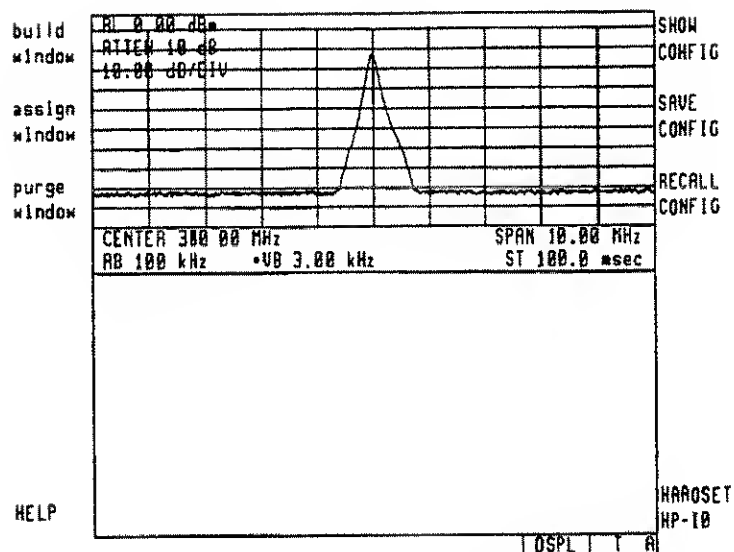
Figure 2-23. Assigning the Other Window

EXAMPLE: Assign two windows to different measuring instruments.

If your system contains more than one instrument, assign the second window to the second instrument. This will result in each instrument writing to a separate window. The two separate traces need not he restricted to sequential updating, as with a single-instrument display. The traces are hoth being taken in real time hy separate instruments. Only the display element is common.

Start with a two-window, one-instrument display similar to Figure 2-24. See the first example in this section.

1. Press assign window

2. Press SELECT WINDOW.

3. Use the step keys to select the window that is defined hut not written to.

4. Press HP-MSIB COLUMN.

5. Turn the knob until the other instrument is indicated at the bottom of the screen.

On the front panel of each master module (on row 0) is an "ACT," or active, LED light. The two local oscillators can be distinguished by the ACT LED the module indicated by the hottom line on the display screen will light its ACT LED.
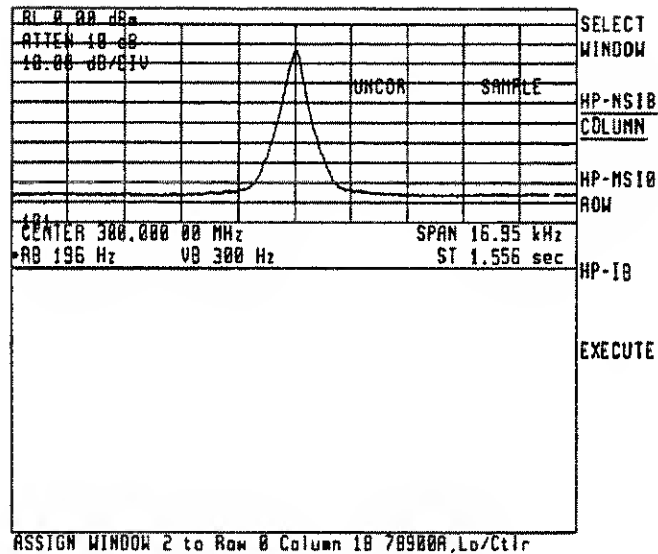
Figure 2-24. Building the Second Window

Once the other instrument has been indicated, press ▓EXECUTE▓ and
the second instrument's trace information should appear in the other
window as in Figure 2-25.
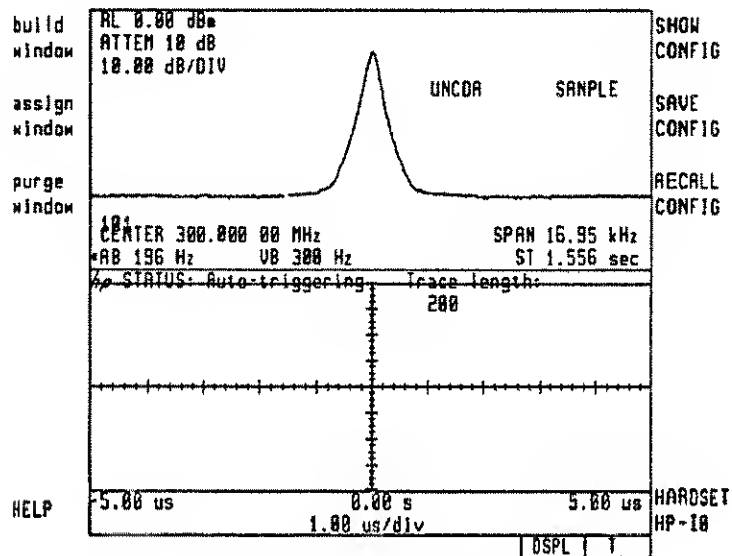
Figure 2-25. Assigning the Second Window

The keys now displayed are those of the display. By pressing (USER)
or (MENU), keys for one of the instruments will be obtained.

To control the other instrument, press ▓assign keybd▓, use step
keys to select a window, and press (USER) or (MENU). See the

assign keybd description in this chapter. assign window shifts the instrument's output back and forth between windows. assign window, however, does not disturb the link between the keyboard and an instrument. Whichever instrument has the keyboard before assign window is used will have it afterward.

Purge Window

purge window removes a previously defined window from the screen. Upon pressing EXECUTE, the window is destroyed, and any link with an instrument or module is broken. Trace information displayed in the window disappears from the screen, but is not destroyed: it resides in the spectrum analyzer and may be accessed again by assigning a different window to the analyzer See build window and assign window.

EXAMPLE: Purge two windows.

Start by building two windows, as in the build window example (#1 on the bottom, #2 on the top). Assign window #1 to a spectrum analyzer. The resulting screen should be similar to Figure 2-26.
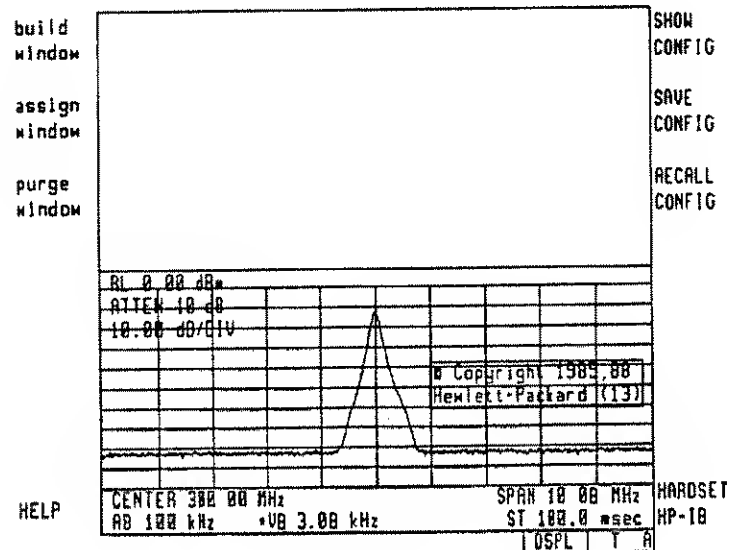
Figure 2-26. Building Two Windows

1. Press purge window.

2. Press SELECT WINDOW.

3. Use the step keys, knob, or keypad (plus ENTER) to select window #1 (the window with the trace displayed).

4. Press EXECUTE . The entire window should disappear as in Figure 2-27.

```
build                                               SHOW
window                                              CONFIG

assign                                              SAVE
window                                              CONFIG

purge                                               RECALL
window                                              CONFIG




HELP                                                HARDSET
                                                    HP-IB
                              [ DSPL | T ]
```
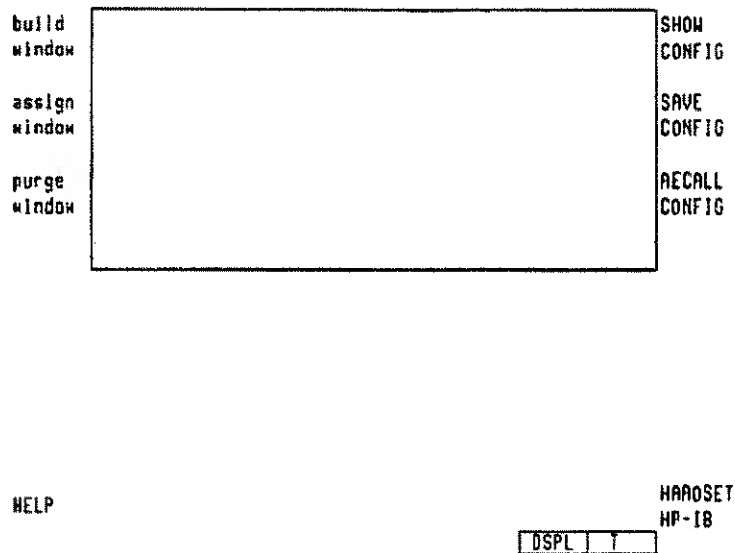
Figure 2-27. Select Window #1

To remove the second window:

1. Press purge window .

2. Press SELECT WINDOW .

3. Use the step keys to select window #2.

4. Press EXECUTE and the remaining window should disappear. See Figure 2-28.

```
build                                              SHOW
window                                             CONFIG

assign                                             SAVE
window                                             CONFIG

purge                                              RECALL
window                                             CONFIG




                                                   HARDSET
          HELP                                     HP-IB
                                    ┌──────────────────┐
                                    │ DSPL │    │   A │
                                    └──────────────────┘
```

Figure 2-28. Removing the Second Window

Note 👉 Windows need not be purged and rebuilt in order to change size. An existing window can be modified simply by nsing build window.

Hardset/Softset HP-IB

HARDSET/SOFTSET HP-IB helps select HP-IB address that the display will bave when HP 70000 Series is next turned on. Switch the modes back and forth between HARDSET and SOFTSET by pressing the HARDSET/SOFTSET HP-IB key.

Note 👉 In tbe HARDSET mode, the display will power-up witb an HP-IB address identical to HP-MSIB address. See the "Address Map" description.

EXAMPLE: Demonstration of HARDSET HP-IB action.

Change HP-IB address of the display by using SET HP-IB. SET HP-IB is available via the keystroke sequence (DISPLAY) and address map. See "Address Map" in this chapter. Make sure that HP-IB address does not match the HP-MSIB address. See Figure 2-29.

Figure 2-29. Changing the HP-IB Address

1. Press (DISPLAY).

2. Press config display

3. Press HARDSET/SOFTSET HP-IB so that the display is left in the HARDSET mode, as in Figure 2-30.

Figure 2-30. Hardset HP-IB

Turn the system off and then on. Look at the display in the address map by pressing (DISPLAY), ADDRESS MAP, and using the knob to move the cursor to the display.

Note that HP-IB address is now the same as the HP-MSIB column address, as in Figure 2-31.

Figure 2-31. Hardset HP-IB Unchanged

| Note | In the SOFTSET HP-IB mode, HP-IB address of the display, upon power-up, will be the same as it was before the power was turned off. In fact, that address will be retained even if the instrument is disconnected from the power source and transported. |

EXAMPLE: Demonstrate SOFTSET HP-IB action.

As in the last example, set HP-IB address of the display to something other than its the HP-MSIB row address.

Select SOFTSET mode by pressing (DISPLAY), CONFIG display, and HARDSET HP-IB. This will toggle the options back and forth between HARDSET and SOFTSET. Leave the display in the SOFTSET mode, as in Figure 2-32.
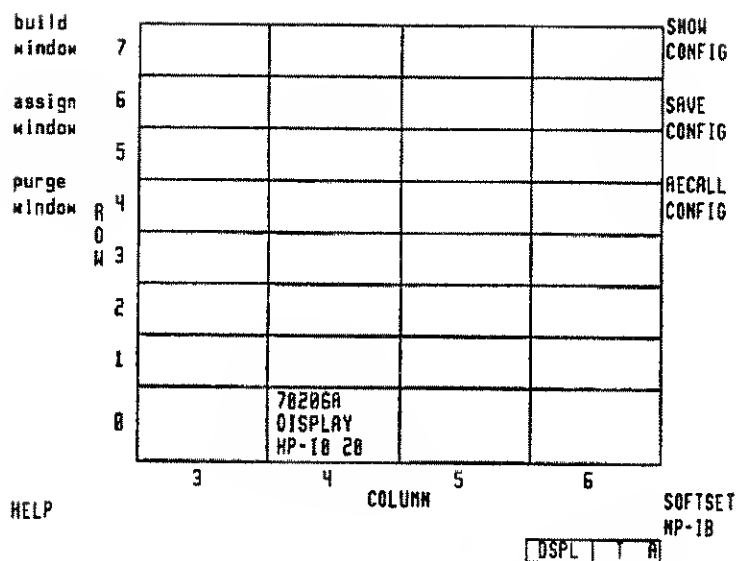
Figure 2-32. Setting Softset HP-IB

Turn the instrument off and then on.

Look at the display in the address map by pressing (DISPLAY),
address map, and turning the knob to place the cursor on the
display.

Note that HP-IB address is the same as it was before the power was
turned off, as in Figure 2-33.
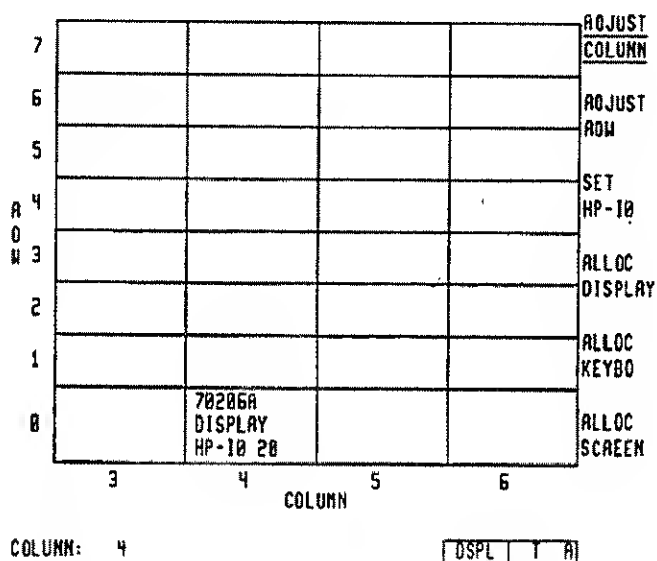
Figure 2-33. HP-IB Address Changes at Power Up

Note 👆 HARDSET/SOFTSET HP-IB affects HP-IB address of the only the display, not the spectrum analyzer master module. Also, this key affects the address only after the instrument has been shut off and then turned on again, and does not keep the user from changing HP-IB address of the display or the local oscillator (by means of the SET HP-IB key).

Help

The HELP key brings up a screen that contains brief descriptions of several config display keys. See Figures 2-34 and 2-35, below.

```
┌─────────────────────────────────────────────────────┐
│SHOW CONFIG                                           │
│   Displays a summary of the current Display screen   │
│   configuration (4 windows and 1 keyboard). The ↑/↓  │
│   keys show each of 4 stored configurations.         │
│                                                      │
│SAVE CONFIG, RECALL CONFIG                            │
│   Saves or recalls a screen configuration to or from │
│   one of the 4 screen configuration registers.       │
│                                                      │
│BUILD WINDOW                                          │
│   Defines the  screen  area  (window)  available  to │
│   a module,  or  modifies an existing window. Once a │
│   window is built use ASSIGN WINDOW to assign  it to │
│   a module.                                          │
│                                                      │
│ASSIGN WINDOW                                         │
│   Links a window to a module.  This is necessary for │
│   information to be displayed in that window.        │
│                                                      │
│PURGE WINDOW                                          │
│   Destroys a  window.  The displayed  information is │
│   retained in the instrument.                        │
│                                          ┌────┬───┬──┐│
│                                          │DSPL│ T·│ A││
│                                          └────┴───┴──┘│
└─────────────────────────────────────────────────────┘
```
MORE

Figure 2-34. config display **Help Screen, Page #1**

```
build          HARDSET/SOFTSET HP-IB                               SHOW
window            Determines the power-up HP-IB address of the     CONFIG
                  Display  SOFTSET retains the address present when
                  power was turned off. HARDSET makes the HP-IB
assign            address the same as the HP-MSIB column address.   SAVE
window                                                              CONFIG

purge                                                              RECALL
window                                                             CONFIG




HELP                                                              HARDSET
                                                                 HP-IB
                                                       DSPL   T  A
```
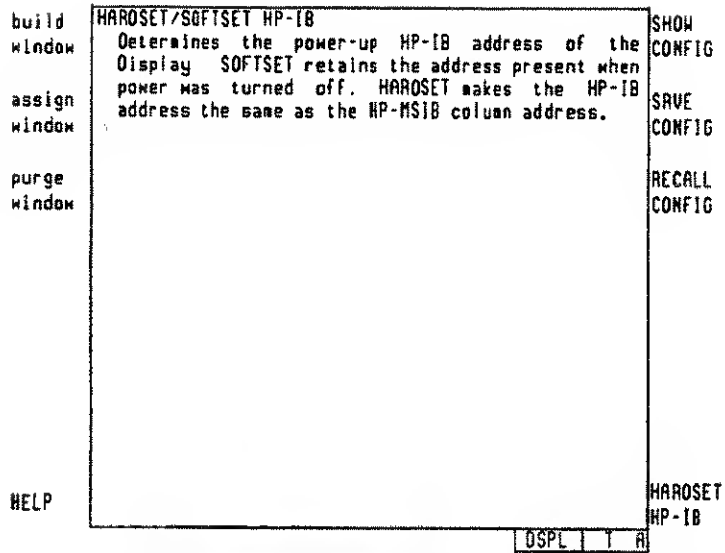
Figure 2-35. config display **Help Screen, Page #2**

Show Configuration

The display has six resources that it can allocate or assign to any of several HP 70000 series elements: these resources consist of a screen composed of up to four windows, plus a fifth window reserved for a controller on HP-IB, and one keyboard. The fifth window is "invisible" in that it does not show up in SHOW CONFIG. Press config display, SHOW CONFIG, to show the following:

- Which windows are defined (1 through 4).

- The dimensions of each window.

- The instrument or module each window is allocated to (that is, which module can write to a given window).

- Which module the keyboard is assigned to.

SHOW CONFIG not only brings up the current configuration of the display but also shows four other complete display configurations. These configurations reside in continuous-memory registers, so they will be recalled even if the power had been turned off.

See the sections in this chapter on SAVE CONFIG and RECALL CONFIG for more information.

EXAMPLE: View the current configuration.

1. Press (DISPLAY).

2. Press config display.

3. Press SHOW CONFIG .

In the figure below, only one window is defined, and it is assigned to an HP 70900B Local Oscillator module at HP-MSIB address 0, 18. The keyboard is also assigned to that module. This is the standard configuration obtained by pressing SELECT INSTR .

The window is of standard size; namely, it is 800 pixels wide (911 − 112 + 1) and 368 pixels high (383 − 16 + 1), which leaves room for keys. Windows 2, 3, and 4 are undefined.

```
build      CURRENT CONFIGURATION                          SHOW
window                                                    CONFIG
           Window 1
           Keyboard: 70900A,Lo/Ctlr       (  0, 18)
assign              Xmin,Ymin:   112,  16               SAVE
window              Xmax,Ymax:   911, 383               CONFIG

purge      Window 2: undefined                          RECALL
window                                                  CONFIG
           Window 3: undefined

           Window 4: undefined




                                                        HARDSET
HELP                                                    HP-IB
           USE ↓/↑ TO SHOW PREV/NEXT CONFIGURATION  DSPL   ↑ A
```
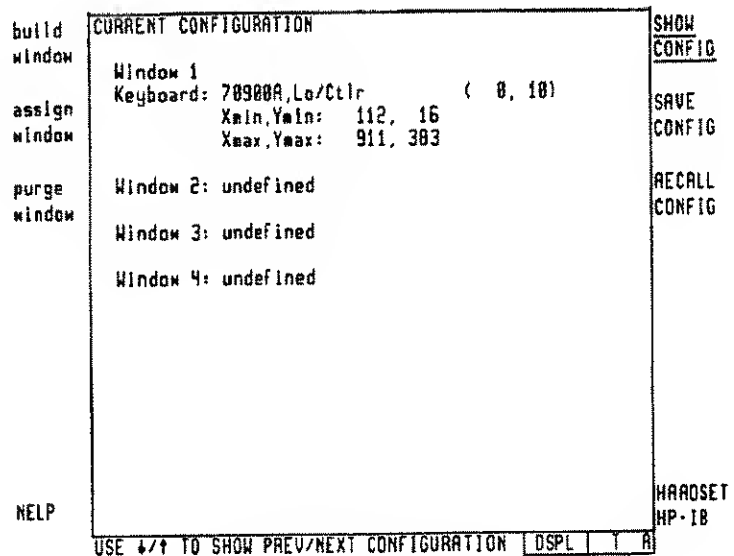
Figure 2-36. Show Current Configuration

EXAMPLE: View Configuration Registers 1 through 4.

There are four continuous-memory registers that store display configurations. To view these, perform the following step.

1. Press (DISPLAY).

2. Press config display

3. Press SHOW CONFIG (which will display the current configuration).

4. Press the (↑) key. Configuration Register 1 should appear.

5. Press the (↑) key three more times to view Configuration Registers 2, 3, and 4. See Figure 2-37.

```
build      | CONFIGURATION REGISTER 2                          | SHOW
window     |                                                   | CONFIG
           |    Window 1:  undefined                           |
assign     |    Window 2:  undefined                           | SAVE
window     |                                                   | CONFIG
           |    Window 3:  undefined                           |
purge      |                                                   | RECALL
window     |    Window 4:  undefined                           | CONFIG
           |                                                   |
           |                                                   |
           |                                                   |
           |                                                   |
           |                                                   |
           |                                                   | HARDSET
HELP       |                                                   | HP-IB
           | USE ↓/↑ TO SHOW PREV/NEXT CONFIGURATION  | DSPL | ↑ | A |
```

Figure 2-37. Configuration Register #4

If the current configuration or any of the registers contain only undefined (and unassigned) windows, try using build window and assign window to reconfigure the display. Then use SAVE CONFIG to store the new configuration. Observe how the changes are shown on the Current Configuration and Configuration Register screens by using the SHOW CONFIG key. If multiple instruments are available on HP-MSIB, try using assign keybd.


```
build      | CURRENT CONFIGURATION                             | SHOW
window     |                                                   | CONFIG
           |    Window 1                                       |
           |    Keyboard: 70900A,Lo/Ctlr        (  0,  10)     |
assign     |              Xmin,Ymin:   112,  16                | SAVE
window     |              Xmax,Ymax:   911, 199                | CONFIG
           |                                                   |
purge      |    Window 2:  70700A,DIGITIZER     (  0,   9)     | RECALL
window     |              Xmin,Ymin:   112, 200                | CONFIG
           |              Xmax,Ymax:   911, 383                |
           |                                                   |
           |    Window 3:  undefined                           |
           |                                                   |
           |    Window 4:  undefined                           |
           |                                                   |
           |                  .                                |
           |                                                   | SOFTSET
HELP       |                                                   | HP-IB
           | USE ↓/↑ TO SHOW PREV/NEXT CONFIGURATION  | DSPL | ↑ | A |
```

Figure 2-38. Current Configuration

For example, Configuration Register 1 shown in the ahove figure describes the layout of the screen shown in Figure 2-39, helow. The keys shown are for the analyzer writing to the bottom window (window #1). This can he inferred from "Keyboard" appearing helow "Window 1" in Figure 2-38. Users can determine whether window #1 is the bottom window by comparing the Ymin and Ymax values for the two windows. See build window.
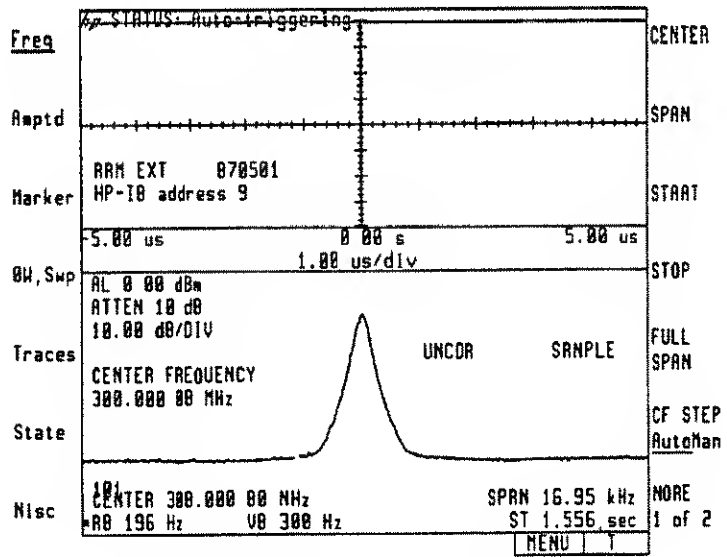
Figure 2-39. Configuration Register #1

Save Config/Recall Config

SAVE CONFIG stores the complete configuration of the screen windows in a continuous-memory register. Four registers are availahle, 1 through 4. See SHOW CONFIG.

Note ☞ The Current Configuration will he retained if the power is turned off, hut will be lost if a different configuration is recalled from one of the four registers.

RECALL CONFIG lets the user reconfigure the screen to a previously saved state with only a few keystrokes.

EXAMPLE: Save a screen configuration and recall it.

1. Configure a screen with multiple windows, as in Figure 2-40. See the build window example.

2. Assign an instrument (for example, a spectrum analyzer) to one window. See the assign window section of this chapter.
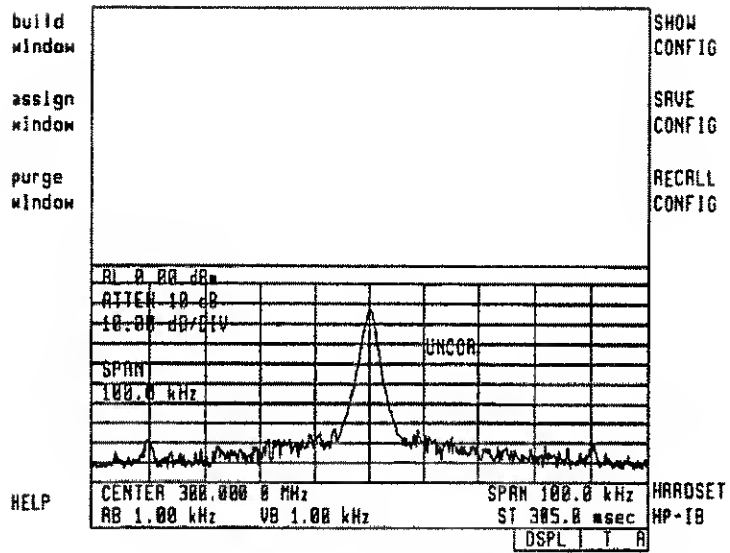
Figure 2-40. Recall Configuration

To save the configuration:

1. Press (DISPLAY).

2. Press config display.

3. Press SAVE CONFIG.

4. Press (1).

5. Press ENTER.

To change the current configuration by purging the lower window:

1. Press config display.

2. Press purge window.

3. Press (1).

4. Press ENTER.

5. Press EXECUTE.

The screen should resemble Figure 2-41.

```
build                 ┌─────────────────────────┐                    SHOW
window                │                         │                    CONFIG
                      │                         │
assign                │                         │                    SAVE
window                │                         │                    CONFIG
                      │                         │
purge                 │                         │                    RECALL
window                │                         │                    CONFIG
                      │                         │
                      └─────────────────────────┘
```

HELP   HARDSET
                                                                      HP-IB

                                              ┌─────────┐
                                              │ DSPL T │
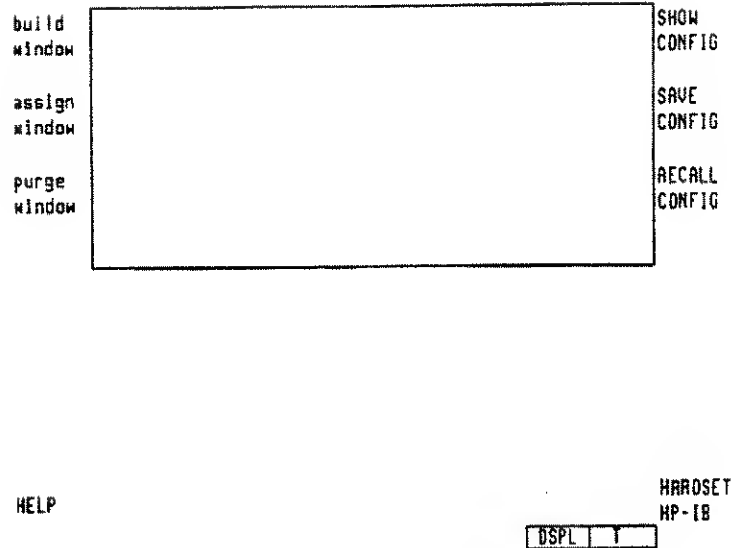   └─────────┘

Figure 2-41. Save Configuration

To recover the original screen:

1. Press (DISPLAY).

2. Press config display.

3. Press RECALL CONFIG.

4. Press (1).

5. Press ENTER.

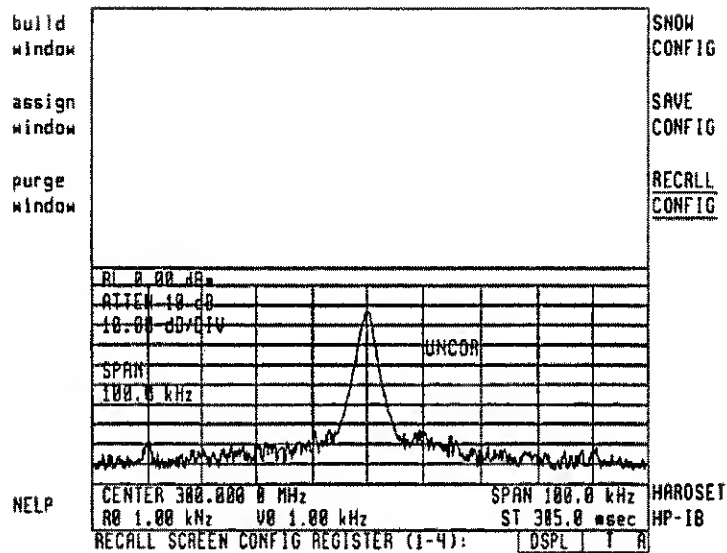The recovered configuration should look the same as the configuration that was saved.

Figure 2-42. Recover the Original Configuration

Print   The `PRINT` key (or (PRINT) key on HP 70206A System Graphics display) initiates a raster print dump of the screen (and of the instrument's keys if configured to do so).

EXAMPLE: Print a copy of the instrument display.

Note   To follow this example, you may need to enter the address of your printer into the HP 70000 system and specify whether the keys are to be printed. Refer to the `printer is` and `KEYCOPY ON/OFF` keys in the `define hardcpy` section of this manual.

1. Enter the address of your HP-IB printer via the `printer is` key, available under `define hardcpy`. Select `KEYCOPY ON/ OFF` if desired.

2. Obtain the instrument display you want to print by using the keys in the (USER) menu.

3. Press (DISPLAY).

4. Press `PRINT` (or the (PRINT) key on HP 70206A System Graphics Display). The printing process will begin immediately. It can be halted by pressing any front-panel key on the display during the print sequence. The screen will be frozen until the data transfer to the printer is complete.

When `PRINT` is pressed, the screen displayed will be printed.

The keys printed if `KEYCOPY ON/ OFF` is selected are the last ones displayed that were associated with the *instrument*, not the display element. Keys available under (DISPLAY) are referred to as "display utility keys" and are not normally shown on hardcopy output.

The raster print dump process works with HP raster-format printers (dot-matrix) that can accept printer dumps of at least 384 lines by 512 points; for example, HP 2673A printer and HP 2225A Thinkjet Printer have this capability. (The HI RES ON/OFF function, described in define hardcpy, requires capability of 384 lines by 1024 points.) Most of the printers that work with HP 9000 Series 200/300 computers will work with HP 70000 system.

Direct hardcopy output from HP 70000 system without a controller requires a display element, either HP 70205A or HP 70206A.

Plot Pressing PLOT initiates a vector plot dump over HP-IB to the plotter specified under define hardcpy. The operation of this key is almost identical to the operation of PRINT, but HP-IB output address of the plotter is set using plotter is rather than printer is.

Refer to the PRINT command for instructions on using this command when a computer is on HP-IB.

Note   HP 70205A and HP 70206A displays require that the plotter implement HP-GL, Hewlett-Packard Graphics Language. These displays work with plotters such as HP 7470A, HP 7475A, HP 7090A, and HP ColorPro.

See the plotter is key description to set the plotter parameters, including HP-IB address.

Define Hardcopy The define hardcpy key allows the user access to several keys which are used to define parameters for hardcopy output. See Figure 2-43 below. These parameters include:

- COPY IS PRT/PLT determines whether the printer or plotter will be the destination when a CY (copy) command is sent.

- DEFAULT VALUES sets the standard default values for the printer and plotter:

  □ printer is: HP-IB TLK/LSN 1

  □ plotter is: HP-IB TLK/LSN 5

  □ COPY IS PRT/PLT: PRINTER

  □ HI RES ON/OFF: OFF

  □ EJECT ON/OFF: ON

  □ KEYCOPY ON/OFF: OFF (not shown), between plotter params and HI RES ON/OFF.

- **plotter params** defines the limits used for plotter dumps when the display cannot ask the plotter what limits to use (for example, listen-only plotters).

- **KEYCOPY ON/OFF**. When ON, the printer and plotter outputs will copy the key labels, title line, and status box. When OFF, these items will be blanked.

- **HI RES ON/OFF**. When ON, the printer is set to high-resolution and all 1024 display points are dumped on each line (dumps normally are 512 points per line).

- **EJECT ON/OFF**. When ON, page ejects are sent at the end of dumps.

Note

Older plotters, such as HP 9872B, will show an error when they receive the page eject command. Use **EJECT OFF** to keep this from occurring.

See subsequent key descriptions for further instructions.

plotter params

RL 0.00 dBm
ATTEN 10 dB
10.00 dB/DIV

UNCOR

SPAN
100.0 kHz

HI RES ON/OFF

EJECT ON/OFF

HELP

CENTER 300.000 0 MHz   SPAN 100.0 kHz   DEFAULT
RB 1.00 kHz   VB 1.00 kHz   ST 305.0 msec   VALUES

printer is

plotter is

COPY IS
PRT/PLT
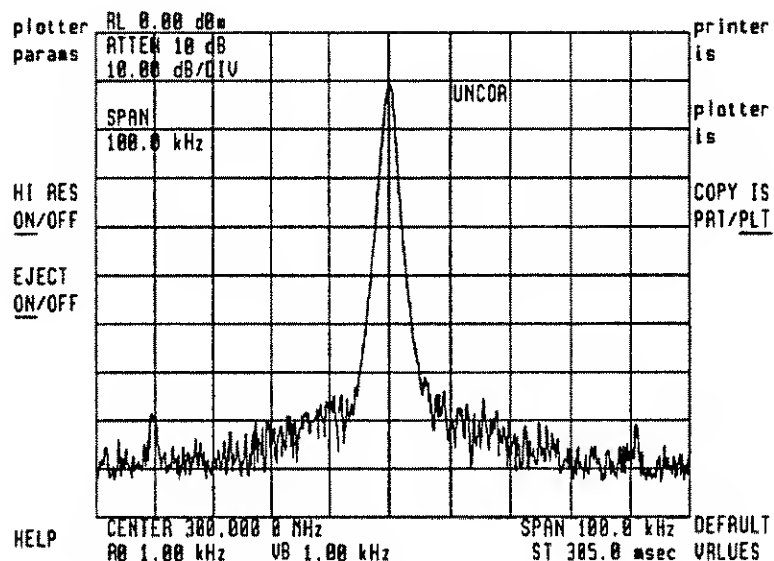
Figure 2-43. Define Hardcopy Menu

Printer Is

printer is defines HP-IB address and status of the output printer. The printer's address can be entered as:

- TLK/LSN, or talk/listen. (For example, TLK/LSN 1 means that the display expects the printer to be in talk/listen status at HP-IB address1.)

■ L ONLY, or listen only (sometimes called "listen always"). In this mode the printer is expected to be set to listen only on HP-IB. (For instructions, consult the operating documentation for the specific printer to be used.)

EXAMPLE: Set the expected printer address to HP-IB talk/listen 01.

1. Press (DISPLAY).

2. Press define hardcpy.

3. Press printer is.

4. Press HP-IB TLK/LSN.

5. Enter the address 1 (printers are typically addressed at 01).

6. Press ENTER. The address should change immediately, as in the lower-left corner of Figure 2-44.

Figure 2-44. HP-IB TLK/LSN

To select listen-only, press the key so that HP-IB L ONLY is underlined and PRINTER IS HP-IB L ONLY is shown in the lower-left corner as in Figure 2-45.

```
RL 0.00 dBm                                    HP-HSIB
ATTEN 10 dB                                    COLUMN
10.00 dB/DIV

                                               HP-HSIB
                                               ROW

                                               HP-IB
                                               TLK/LSN

                                               HP-IB
                                               L ONLY




CENTER 300.00 MHz                    SPAN 10.00 MHz
RB 100 kHz      *VB 3.00 kHz         ST 100.0 msec
PRINTER IS: HP-IB L ONLY
```
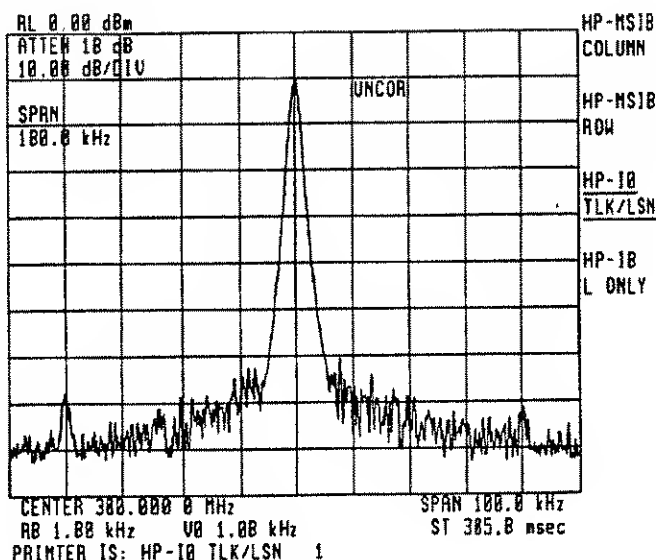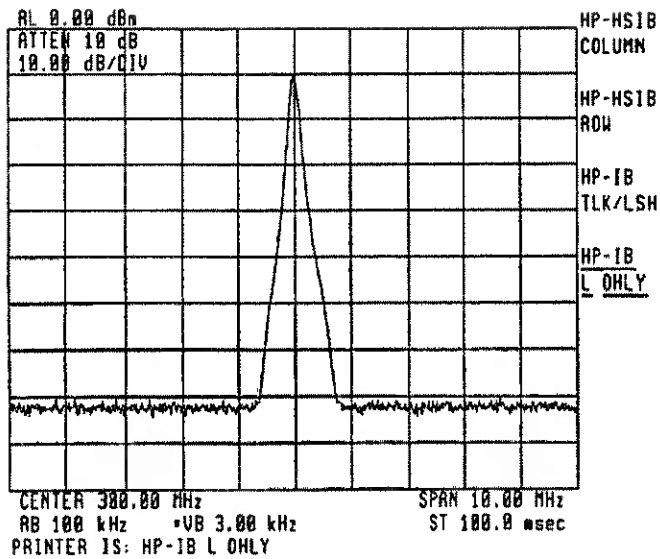
Figure 2-45. HP-IB L ONLY

Switching from HP-IB L ONLY back to HP-IB TLK/LSN will change HP-IB TLK/LSN address to 1. Check the address before you leave the printer is submenu.

HP-MSIB COLUMN and HP-MSIB ROW are used if an HP-MSIB print device is configured.

For a discussion of printer compatibility, see the PRINT key description.

Plotter Is

plotter is is used to specify HP-IB address of the hardcopy output plotter. The operation of plotter is is similar to that of printer is . (Plotters, however, usually have an HP-IB address of 5.)

Note that a listen-only plotter cannot tell the display what its corner points (P1, P2) are. With a listen-only plotter, the display will always use the P1, P2 corner points stored under plotter params (refer to plotter params), overriding the P1, P2 set-up on the plotter.
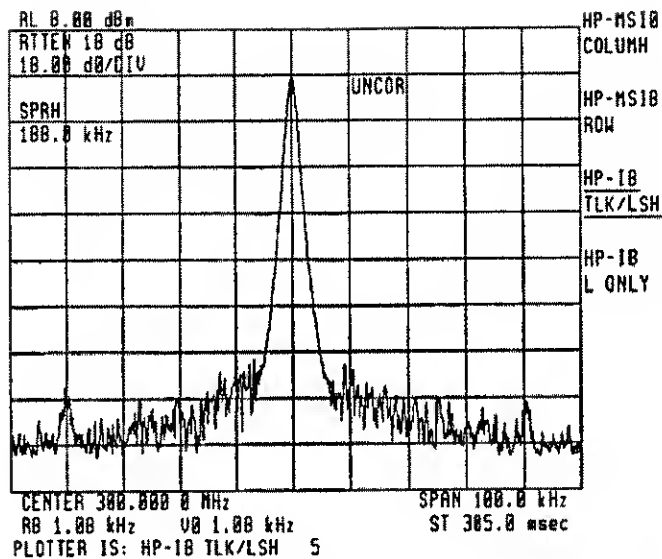
Figure 2-46. Plotter Is

Note ☞ For a discussion on plotter compatibility see the `PLOT` key description.

Plotter Parameters

`plotter params` is a key that allows the user to alter the physical size of hardcopy output plots to listen-only plotters (or to TLK/LSN plotters if the output is initiated by remote control using the command CY 1).
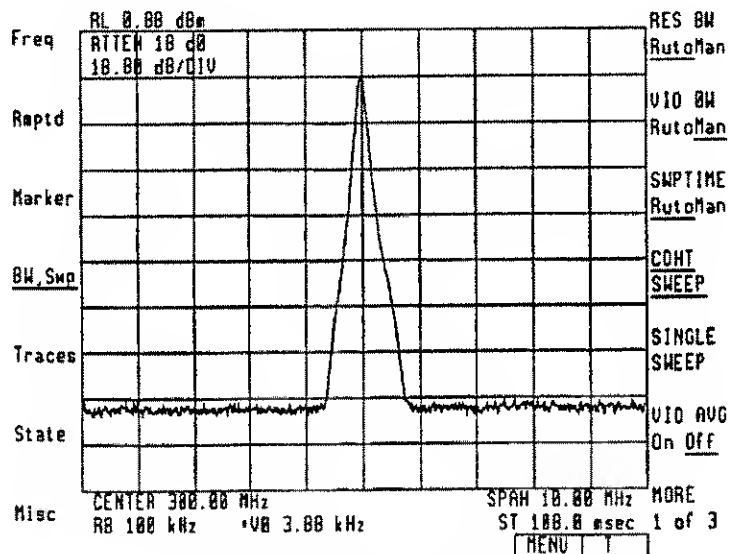
Figure 2-47. Standard Plot
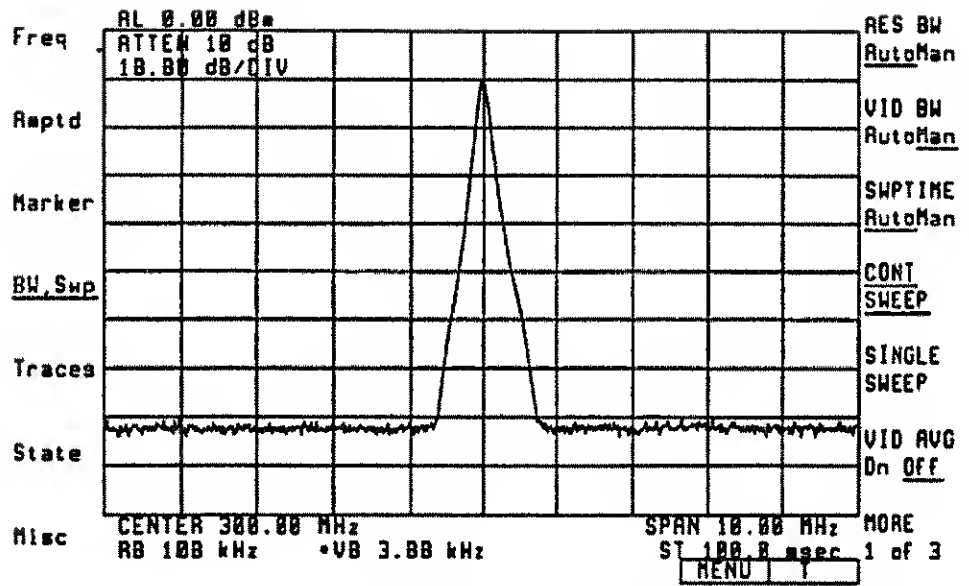
Figure 2-48. Wider Plot
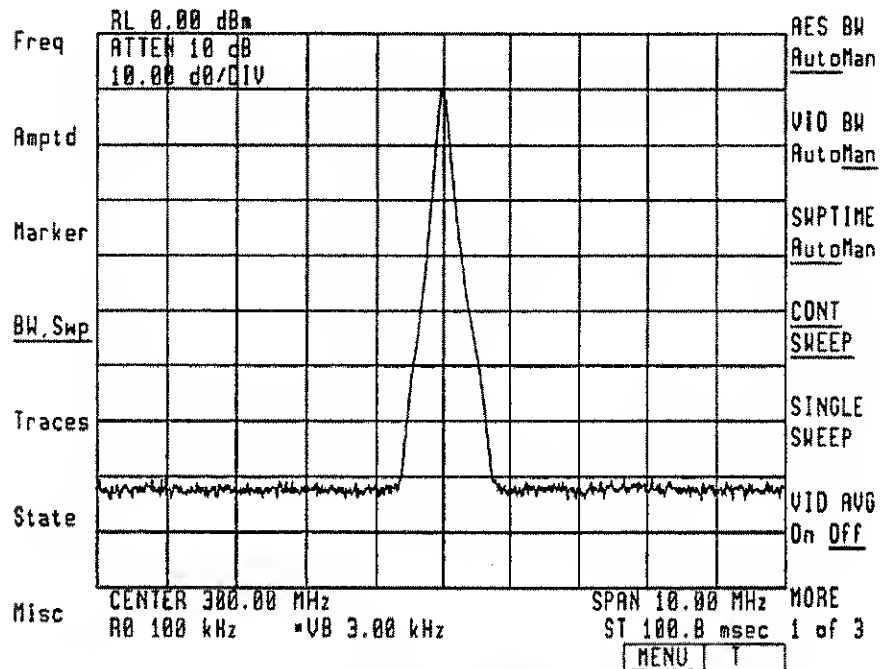
Figure 2-49. Plot Increased in Height
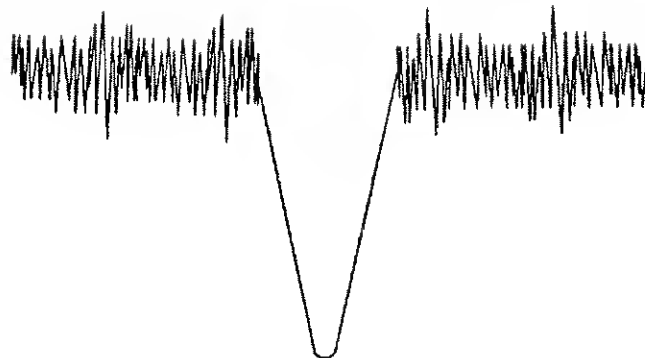
Figure 2-50. Inverted Plot

On HP plotters, the physical size and shape of output plots are determined by the locations of the "Scaling Points, P1 and P2." These locations are given in Cartesian coordinates: for example, P1 = 100, 100 and P2 = 10100, 7600. The actual size of these units depends on the specific plotter used. Typical unit size is 0.025 mm, or about 0.001 inch. The units are relative to the lower-left corner of the available plotting surface.

In Figure 2-51, the default plotting area for HP 7475A 6-Pen Graphics Plotter is outlined. P1 is the lower-left corner, P2 is the upper-right corner.

Default Plotter Parameters

(as set by the display)

Xmin=100

Ymin=100

Xmax=10,100

Ymax=7,600

p1

Figure 2-51.
Plotter Parameters as Set by HP 70205A and HP 70206A Displays

To set plotter parameters to their standard default values, press (DISPLAY), define hardcpy , and DEFAULT VALUES See DEFAULT VALUES description in this chapter. Xmin, Xmax, Ymin, and Ymax will be set to the values shown in the figure above (Figure 2-51). These values will allow 0.5-inch margins on 8.5-by-11 inch paper.

The plotter parameters are stored in a continuous-memory register; they will be retained even after the power has been turned off. Turning the system off and then on will not set the plotter parameters to their default values. The default values can only be reset by using the sequence in 1 above, or by pressing DISPLAY PRESET .

Instrument Preset (I/P) does not affect the plotter parameters or any other display features.

Plotters may operate differently as a listener (for example, L ONLY) or as a talker/listener (TLK/LSN). Consult the operating instructions for your particular plotter.

Keycopy On/Off

KEYCOPY ON/OFF enables the spectrum analyzer's key labels, status box, and data line to be copied as part of the hardcopy output to either a printer or plotter.

EXAMPLE: Delete keys from an analyzer plot.

1. With KEYCOPY ON and a plotter connected to the display via HP-IB, arrange an analyzer screen to be plotted.

2. Press (DISPLAY).

3. Press PLOT on HP 70205A display (or the (PLOT) key on HP 70206A display). An output plot should appear as in Figure 2-52.
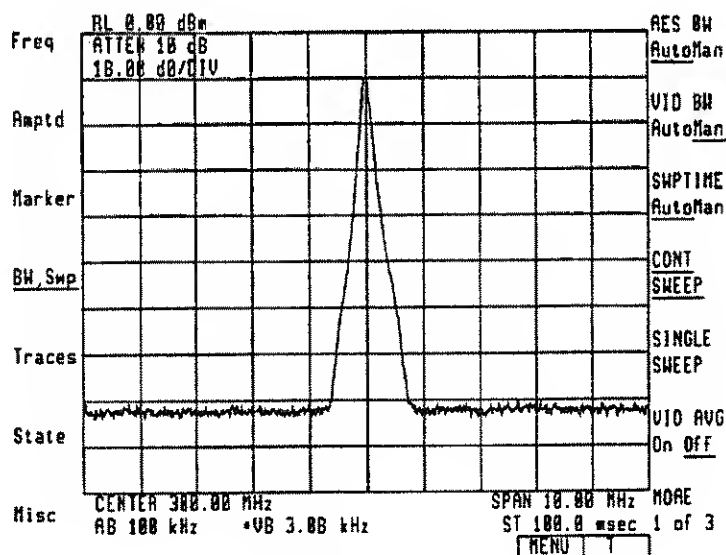
Figure 2-52. Plot Output

To delete the keys from the hardcopy output:

1. Press (DISPLAY).

2. Press define hardcpy.

3. Press KEYCOPY OFF.

This should result in KEYCOPY "OFF", indicating that key labels will not be plotted.

4. Press (USER) or (DISPLAY).

5. Press SELECT INSTR and arrange an instrument display for the plot.

6. Press (DISPLAY).

7. Press PLOT (or the (PLOT) key on HP 70206A).

The resulting plotter output, as in Figure 2-53, should contain no key labels.

RL 0.00 dBm
ATTEN 10 dB
10.00 dB/DIV

UNCOR

SPAN
100.0 kHz

CENTER 300.000 0 MHz
RB 1.00 kHz   VB 1.00 kHz

SPAN 100.0 kHz
ST 305.0 msec
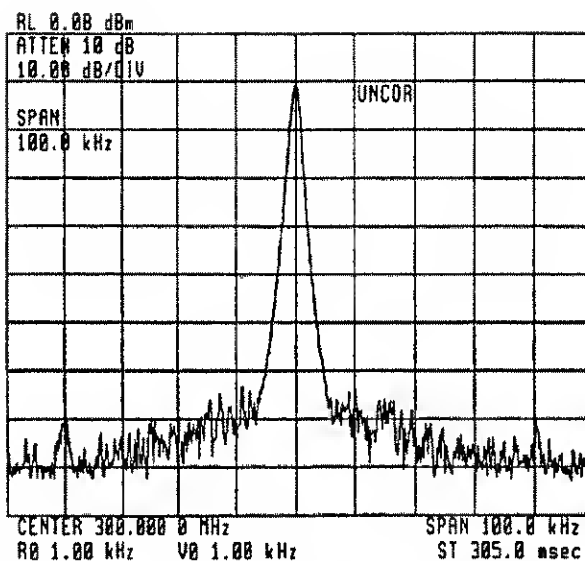
Figure 2-53. No Key Labels

KEYCOPY affects key labels only on hardcopy output. It does not
remove key labels from the screen except during the output.

Key labels accessible under (DISPLAY) are normally not available for
hardcopy output. The key labels that are printed or plotted are the
most recent ones displayed by the instrument, or loaded by the ML
command.

Annotation other than keys can be deleted also, but this is done
by the instrument, not the display. Refer to your instrument's
Operation Manual for information.
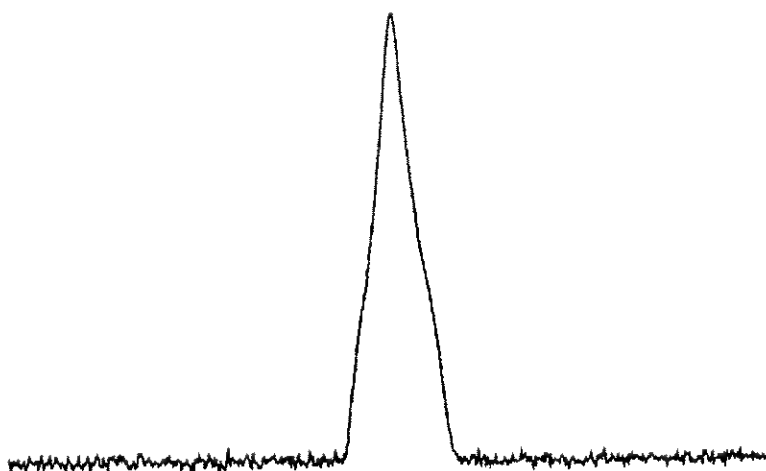
Figure 2-54.
Instrument output with ANNOT OFF, KEYCOPY OFF, and GRAT OFF

Hi Res On/Off

The HI RES option allows the user to obtain higher resolution printouts on certain printers.

To use the HI RES option, press HI RES ON/OFF so that the key appears as HI RES ON, then execute a print operation. See PRINT key description.

Using the HI RES option in a raster print dump, HP 70205A and HP 70206A displays will put out 384 lines with 1024 points per line.

When the HI RES option is not being used, the displays will output 384 lines of 512 points per line.

The higher resolution obtainable with HI RES is available only on raster PRINT operations. HI RES does not affect PLOT operations.

Although HP 2225A Thinkjet printer can accommodate 1024 lines per line, not all raster printer can. Some printers, like HP 2673A, have a line width of less than 1024 points. *Do not* use HI RES with these printers.

When making high-resolution prints with the HP Thinkjet, the printing operation will be slower than usual. This is because the printer must place more dots on each line.

HI RES reprograms the printer to hold more dots per line. When done, it leaves tbe printer in this mode, since it has no way of knowing what mode tbe printer was in to begin with.

Note 👆 HI RES does not work witb the HP PaintJet printer.

Eject On/Off

When the EJECT ON/OFF key is ON a page is ejected at the end of both plotter and printer outputs.

To use the EJECT ON/OFF option press (DISPLAY), define hardcopy, then EJECT ON/OFF.

Note 👆 Many plotters do not implement a page eject featnre.

Copy Is Prt/Plt

COPY IS PRT/PLT determines whether the printer or the plotter will be the destination when a CY (copy) command is received.

To use the COPY IS press (DISPLAY), define hardcopy, then COPY IS PRT/PLT.

Default Values

DEFAULT VALUES automatically sets the value of several nser-definable parameters for hardcopy output. These parameters and their default values are listed in Table 2-2.

Table 2-2. Default Values

PRINTER IS:	HP-IB Talk/Listen at address 1.
PLOTTER IS:	HP-IB Talk/Listen at address 5.
COPY IS:	PRINTER
PLOTTER PARAMS:	Plot limits of Xmin, Ymin = I00, I00
	Plot limits of Xmax, Ymax = 10100, 7600
HI RES:	OFF
KEYCOPY:	OFF
EJECT:	ON

Note 👆 The default plotter limits are those of HP 70470A and HP 7475A plotters. These allow 0.5-inch margins on standard A-size paper (8.5-by-11 inches).

Help

The HELP key under define hardcpy presents a screen of brief descriptions explaining the functions available with other keys in the define hardcpy menu. See Figures 2-55 and 2-56 below.

```
PRINTER IS, PLOTTER IS
  Defines the address of the printer or plotter.

COPY IS
  Determines whether the printer or plotter will be
  the destination when a COPY command is received

DEFAULT VALUES
  PRINTER IS:     HP-IB TLK/LSN 1
  PLOTTER IS:     HP-IB TLK/LSN 5
  COPY IS:        PRINTER
  PLOTTER PARAMS: P1 = (100,100)    P2 = (10100,7600)
  HI RES:  OFF         EJECT:  ON        KEYCOPY:  OFF

PLOTTER PARAMS
  Defines the limits used for plotter dumps when
  the display cannot ask the plotter what limits to
  use (for example, for listen only plotters).

KEYCOPY ON/OFF: When ON, printer and plotter outputs
  will copy the softkey labels, title line, and
  status box. When OFF, these items will be blanked.
```

MORE

`DSPL   T   A`

Figure 2-55. Help Screen, Page #1

plotter
params

```
HI RES ON/OFF:    When ON, the printer is set to high
  resolution, and all 1024 display points are dumped
  on each line (dumps normally are 512 points/line).

EJECT ON/OFF
  When ON, page ejects are sent at the end of dumps.
```

printer
is

plotter
is

HI RES
ON/OFF

COPY IS
PRT/PLT

EJECT
ON/OFF

HELP

DEFAULT
VALUES

`DSPL   T   A`

Figure 2-56. Help Screen, Page #2

Report Errors
The ░REPORT ERRORS░ key gives the user a brief description of any error that has been detected by an element on HP-MSIB.

EXAMPLE: Detect an illegal command sent by HP-IB.

Begin by causing an error. Do this by connecting a compnter or controller to HP 70000 system by HP-IB and sending an illegal command.

Example: OUTPUT 718; "XX"

If the local oscillator (the master module of the spectrum analyzer) has an HP-IB address of 18, it will detect an illegal command. An E will appear in the Status Box at the lower right-hand corner of the screen, as in Figure 2-57. Also, an error message may appear in the upper right-hand portion of the screen.
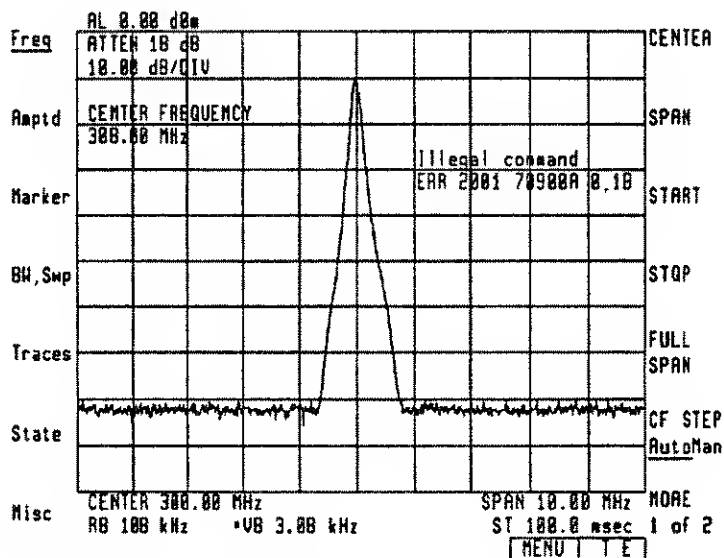
Figure 2-57. Status Box

The user can receive the error report by pressing (DISPLAY), then ░REPORT ERRORS░. A figure similar to Figure 2-58 appears, and provides the following information:

- Which module reported the error (in this case, HP 70900B Local Oscillator module).

- What the HP-MSIB address of that module is (for example, 0, 18).

- An error identification number (for example, 2001).

- A brief description of the error (for example, illegal command).

```
PRINT          ┌─────────────────────────────────┐  DISPLAY
               │ERROR REPORT from                │  PRESET
               │                                 │
               │70900A,Lo/Ctlr  (Row 0, Column 18)│
               │                                 │
PLOT           │2001 70900A 0,18 Illegal command │
               │                                 │
               │                                 │
define         │                                 │  SELECT
hardcpy        │                                 │  INSTR
               │                                 │
               │                                 │
REPORT         │                                 │
ERRORS         │                                 │
               │                                 │
display        │                                 │  assign
tests          │                                 │  keybd
               │                                 │
               │                                 │  address
INTEN          │                                 │  map
ADJUST         │                                 │
               │                                 │
               │                                 │  config
HELP           │                                 │  display
               └──────────────────────┬──────────┘
                                   │ DSPL │  │
                                   └──────────┘
```

Figure 2-58. Reporting Errors

Most errors reported on HP-MSIB are transient errors such as those
caused by illegal commands over HP-IB. These errors, once reported
via REPORT ERRORS, are cleared from memory. Hence they cannot he
reported or viewed a second time.

Other errors reported can be "hard" errors. These are caused by
hardware problems such as unconnected rear-panel cables (see the
following example) or the failure of an internal component. These
problems can affect operation of the instrument, and cannot be
cleared from memory until corrected.

EXAMPLE: Report and correct a hardware error.

If the rear-panel connection (labeled "300 MHz") between the local
oscillator module and the RF section (for example, the HP 70904A)
is removed, an error is detected by the RF section and shown on the
screen. See Figure 2-59.

Figure 2-59. Error Screen

If (DISPLAY) and REPORT ERRORS are pressed, the error screen is shown hut the error is not cleared from memory, as indicated hy the presence of the E in the status hox. See Figure 2-60.

Figure 2-60. Error Not Cleared

Note that even if the hardware-related error is corrected at this point, it must he reported again to clear the system. Thus, press REPORT ERRORS to clear the system and remove the E from the status hox.

Hardware-related errors must be reported after they have been corrected in order to clear them from memory. This has been done for the following figure.
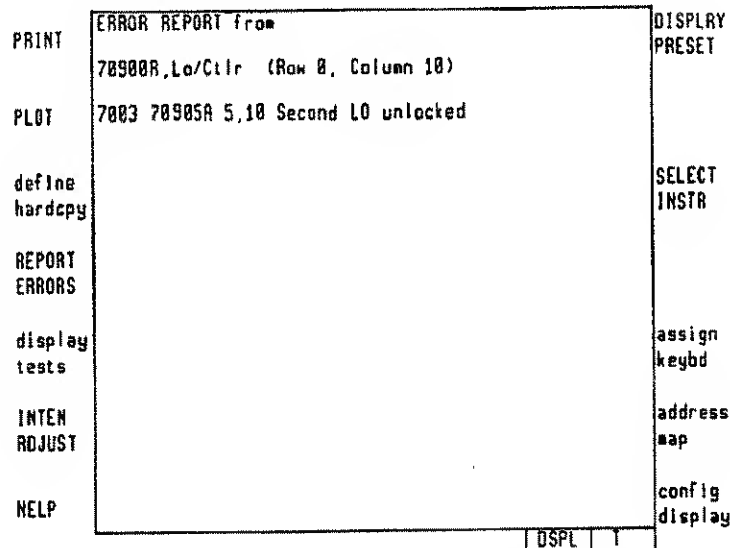


```
PRINT          ┌ERROR REPORT from                          ┐  DISPLAY
               │                                           │  PRESET
               │70900A,Lo/Cltr   (Row 0, Column 10)        │
PLOT           │7003 70905A 5,10 Second LO unlocked         │
               │                                           │
define         │                                           │  SELECT
hardcpy        │                                           │  INSTR
               │                                           │
REPORT         │                                           │
ERRORS         │                                           │
               │                                           │
display        │                                           │  assign
tests          │                                           │  keybd
               │                                           │
INTEN          │                                           │  address
ADJUST         │                                           │  map
               │                                           │
               │                                           │  config
HELP           └                                           ┘  display
                                               ┌DSPL   T┐
```

Figure 2-61. Cleared Errors

EXAMPLE: Clear error reports from multiple instruments.

If a system contains multiple instruments, each instrument will independently report the errors it detects.

For example, send an illegal command via HP-IB both to the display and the spectrum analyzer via a computer.

OUTPUT 704; "XX"

OUTPUT 718; "XX"

This results in an E in the status box, just as with a single error.

After pressing (DISPLAY) and REPORT ERRORS, the error detected by the module with the lowest column address is reported first (and cleared from memory if it is only a transient error).
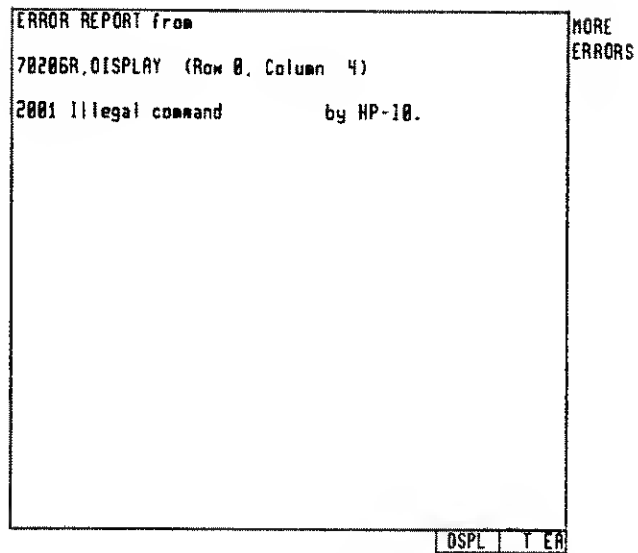
```
ERROR REPORT from                          MORE
                                           ERRORS
70206R,DISPLAY  (Row 0, Column  4)

2001 Illegal command          by HP-10.




















                                      DSPL   T ER
```

Figure 2-62. Multi-Instrument Errors

Notice that instead of the usual key menu under (DISPLAY),
MORE ERRORS appears on the screen and the E remains in the status
box. See Figure 2-63. The second error has not been reported yet.

Press MORE ERRORS, and the last error is reported (and cleared if it
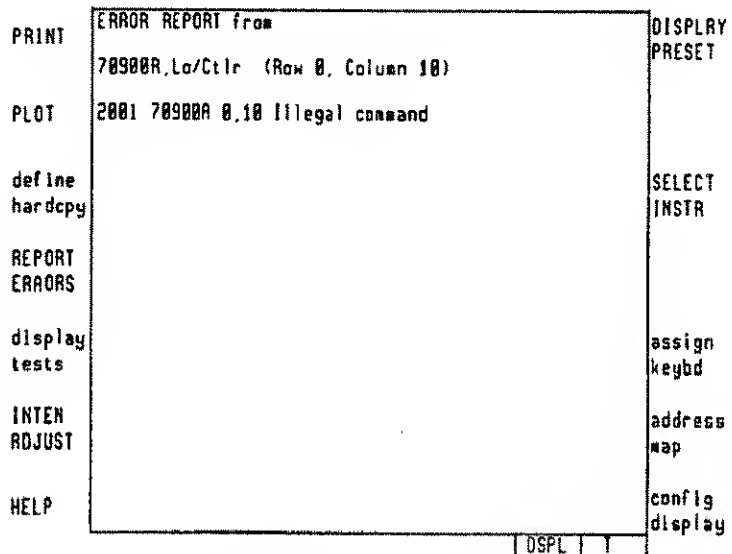is only a transient error).

```
         ERROR REPORT from                      DISPLAY
PRINT                                           PRESET
         70900R,Lo/Ctlr  (Row 0, Column 10)

PLOT     2001 70900R 0.10 Illegal command


define                                          SELECT
hardcpy                                          INSTR

REPORT
ERRORS

display                                          assign
tests                                            keybd

INTEN                                            address
RDJUST                                           map

HELP                                             config
                                                 display
                                      DSPL   T
```

Figure 2-63. Clearing Multi-Instrument Errors

Display Tests

The display tests key gives the user access to a menu of keys that provide operational tests of HP 70205A or HP 70206A displays themselves, their internal operation, and the keypad and knob.

Figure 2-64 shows the key submenu that appears when display tests is pressed.

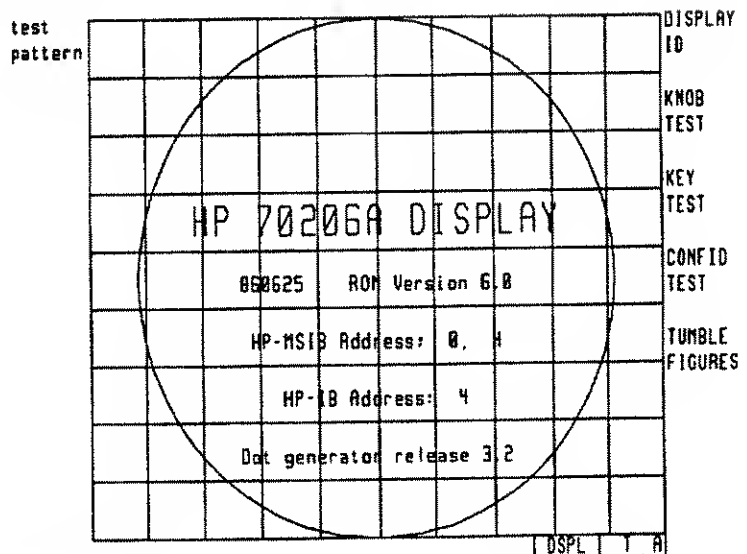See the following pages for a description of each display tests subkey and its operation.

Figure 2-64. Display Tests Menu

Display Id

The DISPLAY ID key brings up an identification screen similar to the figure above. This provides:

- Basic verification of display operation.

- Display model number (for example, the HP 70205A).

- ROM firmware version of the display.

- HP-MSIB address (row, column) of the display.

- HP-IB address of display.

- Dot Generator Release code (for example, 3.1). (This is provided for firmware updating purposes.)

Note	This display screen does not provide the ROM version of other modules. For that information, see the appropriate section of the operating instructions for that module. For instance, the local oscillator's ROM version is available by pressing (MENU), CONFIG, and ROM VERSION.

| Note	Both displays can only have a row address of zero. The default address is row 0, column 4 (0,4).

Note	The HP-IB address does not necessarily correspond to the HP-MSIB column address. To change the address of any HP-IB enabled module, see the operating instructions in this chapter for the SET HP-IB key, which is available under address map.

Knob Test

The KNOB TEST key brings up a test pattern similar to the one shown in Figure 2-65.
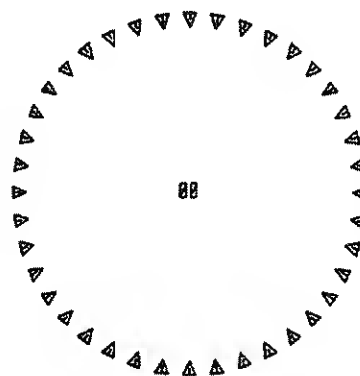
Figure 2-65. Knob Test

As the knob is turned, the test pattern rotates. This provides a test of the mechanical and electrical operation of the display knob. Note that the step keys will rotate the pattern but the numeric entry keypad will not.

Key Test

The ▓KEY TEST▓ key allows the user to check the mechanical and electrical operation of every front-panel key on the display.

EXAMPLE: Use ▓KEY TEST▓.

1. Press ⌜DISPLAY⌟.

2. Press ▓display tests▓.

3. Press ▓KEY TEST▓.

4. Press any key on the display's front panel and it will be echoed on the screen if it is working properly.
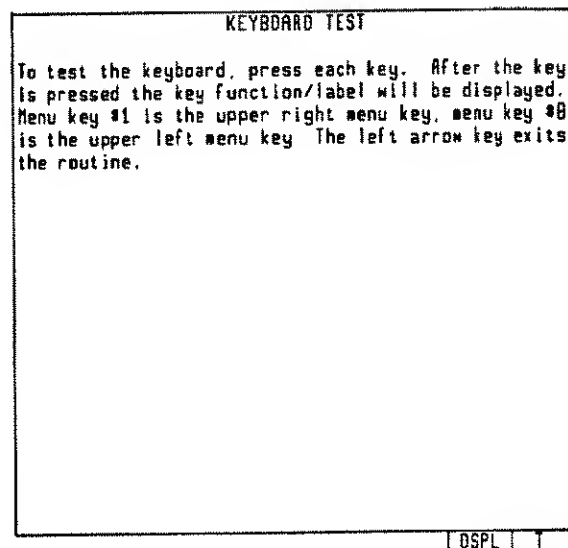
5. Press the ⌜←⌟ (back space) key to exit this function.


```
                        KEYBOARD TEST

To test the keyboard, press each key.  After the key
is pressed the key function/label will be displayed.
Menu key #1 is the upper right menu key, menu key #8
is the upper left menu key  The left arrow key exits
the routine.




                                               DSPL   T
```

Figure 2-66. Key Test

Confidence Test

The display Confidence Test, initiated by pressing the ▓CONFID TEST▓ key, checks the operation of roughly 90% of the display unit. If no fault is found, 6001 confidence test passed appears in the lower-left corner of the screen. If a fault is found, 6008 confidence test failed is shown. In either case, the character set remains on the display.

If an error is detected, refer to the Installation and Verification Manual for your instrument.

Note   In display ROM Version 5.0 the character set is not left on the screen after the confidence test.

Tumble Figures

TUMBLE FIGURES provides a menu of several keys that show rotating three-dimensional figures: BALL , CUBE , HALF , ROD , and SLAB .

■ To change the size of the figures, turn the display knob.

■ To change the speed of rotation about the three spatial axes, press three consecutive numeric keys; for example, press "999" for rapid rotation and "000" to halt rotation.

■ To exit this fnnction, press the ⊡ (hack space) key.

Test Pattern

The key test pattern produces five test patterns used in screen alignment procedures. They are selected by pressing (DISPLAY), display tests , test pattern , entering a number 1 to 5 on the keypad, then pressing ENTER .

| Note | In display ROM Version 5.0 there were four test patterns, with a key for each pattern (for example, PATTERN 1). |

Intensity Adjust

INTEN ADJUST allows the user to change the intensity amplitude of the picture on the screen. Intensity is incrementally adjustahle from 0 to 19 in steps of 1.

| Note | Zero is not necessarily fully off. |

When a display is turned on, it will use the most recent intensity adjustment unless it was set to less than 9. In this case the iutensity will default to 9.

Help

The HELP key under (DISPLAY) provides two pages of information about the operation of the other top-level keys directly accessible under (DISPLAY). See Figure 2-67 for the first of the two pages. Press MORE for the second page.
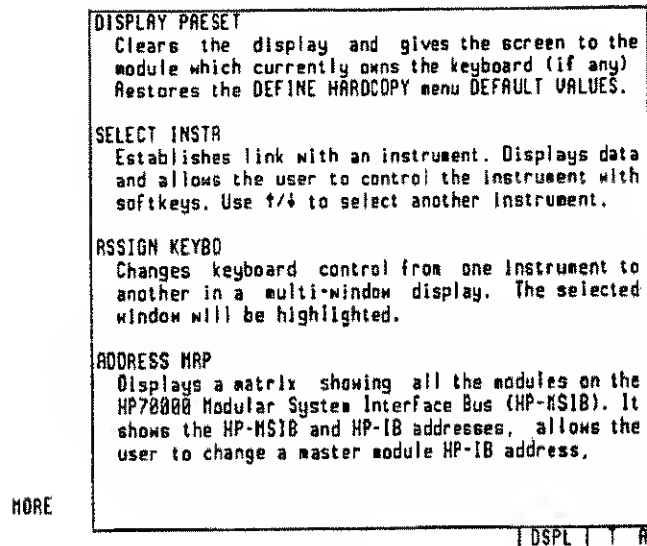
```
┌─────────────────────────────────────────────────┐
│DISPLAY PRESET                                    │
│  Clears  the  display  and  gives the screen to the│
│  module which currently owns the keyboard (if any)│
│  Restores the DEFINE HARDCOPY menu DEFAULT VALUES.│
│                                                  │
│SELECT INSTR                                      │
│  Establishes link with an instrument. Displays data│
│  and allows the user to control the instrument with│
│  softkeys. Use ↑/↓ to select another instrument.  │
│                                                  │
│ASSIGN KEYBD                                      │
│  Changes  keyboard  control from  one instrument to│
│  another in a  multi-window  display.  The selected│
│  window will be highlighted.                     │
│                                                  │
│ADDRESS MAP                                       │
│  Displays a matrix  showing  all the modules on the│
│  HP78000 Modular System Interface Bus (HP-MSIB). It│
│  shows the HP-MSIB and HP-IB addresses,  allows the│
│  user to change a master module HP-IB address.   │
│                                                  │
│                                                  │
│                                                  │
│                                             ┌────┐│
│                                             │DSPL│ ↑ │ ↓│
└─────────────────────────────────────────────┴────┘
```
MORE

Figure 2-67. Display Help, Page #1

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